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NFPA®

1982 EDITION
FIRE FACTS

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A Message from NFPA's President:

It's important to know what we mean by "the American fire problem" before we can design intelligent solutions to it.

In this booklet, the National Fire Protection Association, which has collected fire data since 1896, summarizes current essential fire information for all those who seek to understand the fire problem as well as those who bear the awesome responsibility of allocating scarce resources to combat it directly.

Without the data contributed by the public fire services, much of the information contained in this booklet would not have been possible. And without the contributions of data from the insurance industry and private fire brigades, NFPA would not have been able to develop the national fire estimates and publish the trends that have helped us to characterize our nation's fire problem.

To all of these people — especially our nation's fire service — we dedicate this compilation of statistics.

Robert W. Grant

President
National Fire Protection Association

The National Fire Protection Association is a non-profit technical and educational organization. Its mission is to promote the science and improve the methods of fire protection and prevention; to obtain and circulate information on these subjects; to secure the cooperation of its members and the public in establishing proper safeguards against loss of life and property by fire.

NATIONAL FIRE PROTECTION ASSOCIATION'S

FIRE FACTS

1982 Edition

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Many separate contributions have been made to the current state of the art of measuring the American fire problem. The NFPA particularly acknowledges and thanks: individual fire departments throughout the United States, state fire marshal offices, the Federal Emergency Management Agency, the Johns Hopkins University, the Public Safety Officers' Benefits Program of the United States Department of Justice, the National Safety Council, and insurance associations.

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NFPA No. SPP-71
Library of Congress Card No. 81-85437
ISBN: 0-87765-211-2
Printed in U.S.A.

FOREWORD

This publication is dedicated to the idea that the documentation of fire experience will lead to gains in fire safety. In this booklet NFPA has pulled together the most important scientific knowledge about the occurrence of fire in the United States and the resulting costs in human suffering and property loss. Such statistics are useless unless they point the way to action and let us apply the lessons of past and present experience to improve the future.

The uses of fire experience statistics to improve fire safety are many. Fire must first of all be compared with other problems competing for attention and resources. Then, those resources allocated to fire protection must be effectively deployed to make the greatest impact on the fire problem. Finally, the statistics must be watched to gauge the progress of fire protection.

Specific applications of fire experience results range from the development of the *National Fire Codes* and NFPA's *Learn Not to Burn* public education programs to the planning and budgeting of fire prevention and suppression programs by local fire departments. The wide range of users is illustrated in the table on the next page.

This booklet is a collaboration between NFPA's Fire Analysis and Editorial Divisions. In pulling together statistics from NFPA reports made annually on the U.S. fire experience and other sources, every effort has been made to reflect the state of the art of measuring the American fire problem. NFPA's ongoing program of statistical research is committed to continually advancing that state of the art. Accordingly, we welcome suggestions from readers on ways to improve the selection and presentation of the material in *Fire Facts*.

Fire Facts organizes the essential scientific knowledge about fire experience in the United States today. The purpose is to provide a sound basis for effective action to cut fire losses. We urge the users of *Fire Facts* to take up this challenge and this opportunity.

Dr. Louis Derry, Director
NFPA Fire Analysis Division

Typical Users and Uses of Fire Experience Results

User	Use
1. Fire protection planners at national and state levels	1. Comparing fire to other problems competing for resources. Planning the most effective deployment of resources to make the greatest impact on the fire problem. Monitoring fire protection progress.
2. Local fire service	2. Targeting fire prevention and suppression programs. Backing-up budget requests. Enacting and enforcing fire codes. Developing community firesafety education programs. Monitoring progress.
3. Technical firesafety standards committees	3. Identifying needs for standards. Keeping standards current. Monitoring the performance of standards. Analyzing the benefits and costs of standards.
4. Communicators/ educators	4. Reporting of fire problems. Educating for firesafety.
5. Committees developing fire fighter safety standards, individuals, fire departments working to improve fire fighter safety	5. Identifying reasons for fire fighter deaths and injuries. Developing safety and training programs. Designing protective equipment.
6. Researchers	6. Establishing firesafety research priorities. Designing research programs.
7. Insurers	7. Loss prevention. Risk selection and underwriting.
8. Industry	8. Worker safety. Loss prevention.
9. Product developers	9. Identifying needed products and markets. Modifying products to improve firesafety.
10. Building designers, architects, managers	10. Assuring a fire safe design.
11. Legislators, regulators, enforcers, courts	11. Effective and equitable firesafety laws and regulations.

FIRE FREQUENCY

Fire occurs often and in many places. In the United States, nearly three million fires are attended annually by public fire departments. This means that every 10 seconds a fire department responds to a fire somewhere in the nation. Of these fires, over 700,000 annually occur in the home. That's one residential fire every 45 seconds everyday of the year! Fires occur in motor vehicles at the rate of one every minute, and a fire starts in an outdoor property every 27 seconds. These fires occur in our small towns and metropolitan areas, in our homes and our workplaces, in every geographic area of our country. They cost us thousands of unnecessary deaths and injuries, and billions of dollars in property damage. The following statistics examine where and how often fires occur.

TOTAL FIRES, STRUCTURE FIRES, OTHER FIRES IN THE U.S. (1977-1980)

Total fires in the United States attended by public fire departments during 1977–1980 varied slightly from year to year with no consistent pattern. During this period, the number of fires were at their high in 1977 at 3,264,500 fires. Fires decreased 13.6% in 1978 to 2,817,500 fires, changed little in 1979 at 2,845,500 fires, and were on the upswing in 1980, increasing 5.0% at 2,988,000 fires. Over the four year period, the number of residential fires changed little with an average of 740,000 over the four year period. The number of vehicle fires showed a slight decrease from 508,000 in 1977 to 471,500 in 1980.

By property type, for the four year period, structure fires accounted for 35.7% of all fires and vehicle fires accounted for 16.6% of all fires. Residential fires accounted for 70% of all structure fires.

The table below lists the number of fires by major property use in the United States for fires attended by public fire departments during the years 1977–80.

Total Fires, Structure Fires, Other Fires in the U.S. (1977–1980)

	1977	1978	1979	1980
Residential (Total)	750,000	730,500	721,500	757,500
One- and Two-Family Dwellings*	584,500	569,000	550,500	590,500
Apartments	139,000	137,500	146,000	143,500
Hotels and Motels	14,000	12,000	11,500	11,500
Other Residential	12,500	12,000	13,500	12,000
Public Assembly	34,000	29,500	30,500	29,000
Schools and Colleges	19,000	20,500	22,500	19,500
Institutions	24,500	39,000	29,500	28,000
Stores and Offices	70,000	63,500	64,000	62,000
Industry, Utility, Defense**	54,500	55,000	58,000	55,000
Storage in Structures**	73,000	59,500	64,500	65,500
Special Structures	73,000	64,500	46,000	48,500
TOTAL STRUCTURE FIRES	1,098,000	1,062,000	1,036,500	1,065,000
Outside Fires (with value)	130,000	110,000	80,500	86,500
Vehicles***	508,000	503,000	495,500	471,500
Brush, Grass, Wildland (no value)	734,000	582,500	614,500	718,500
Rubbish	406,000	296,000	342,000	397,000
All Other	388,500	264,000	276,500	249,500
TOTAL FIRES	3,264,500	2,817,500	2,845,500	2,988,000

* Includes mobile homes.

** Since some incidents for these property uses were handled only by private fire brigades or fixed suppression systems and were not reported to the NFPA, the results represent only a portion of U.S. fire experience.

***This category includes highway vehicles, trains, boats, ships, aircraft, farm vehicles, and construction vehicles.

The estimates are based on data reported to the NFPA by fire departments that responded to the 1977, 1978, 1979, and 1980 NFPA National Fire Experience Surveys.

RESIDENTIAL FIRE RATES BY COMMUNITY SIZE AND YEAR

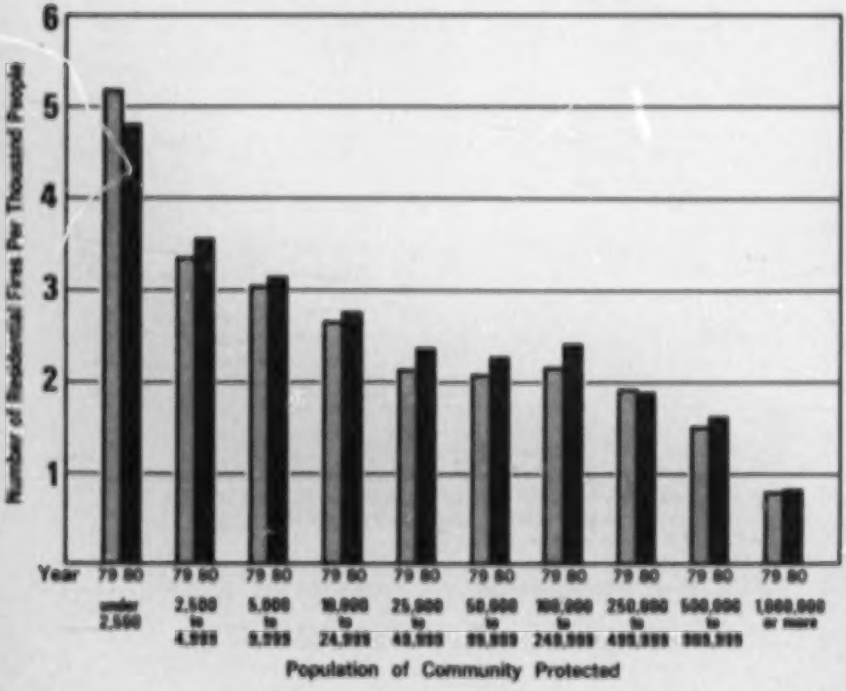
One way to look at fire experience is to examine the number of fires that occur relative to the number of people in an area. This allows more direct comparison of fire experience between communities of different sizes.

The figure below shows the number of residential fires per thousand people by population of community and year (1979, 1980).

By community size, the smallest communities had the higher fire experience rates in both 1978 and 1979; results of analysis in prior years (1977, 1978) indicated the same finding.

By year, slightly higher residential fire rates were experienced in 1980 than in 1979.

Fires per Thousand People by Region and Population Protected (1980)



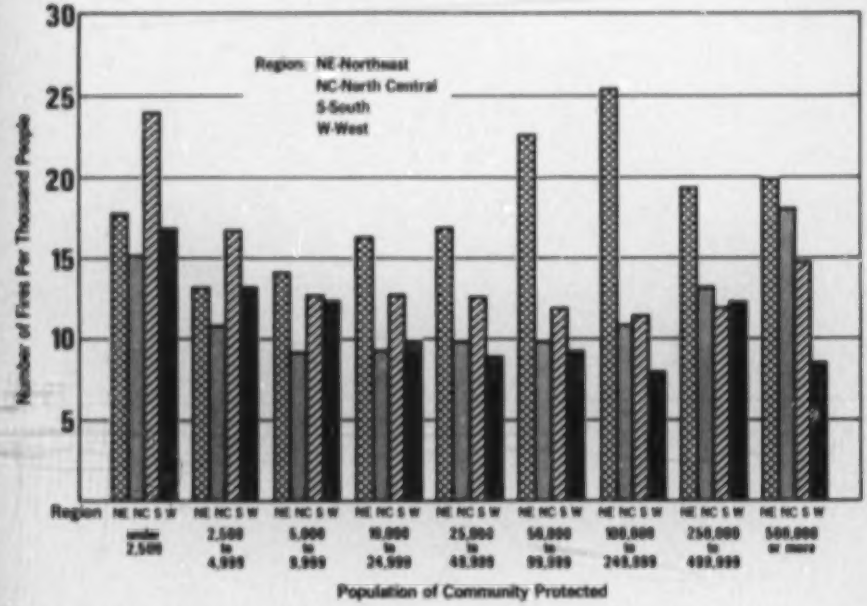
Source: NFPA's Survey of Fire Departments for U.S. Fire Experience (1979, 1980)

FIRES PER THOUSAND PEOPLE BY REGION AND POPULATION OF COMMUNITY (1980)

The figure below shows the number of fires per thousand people by region of the country and population of community (1980).

By region, the Northeast experienced higher fire rates than the other regions in all communities over 5,000 population. The South experienced the highest rates for the smaller communities (under 5,000 population). Results of analyses in prior years (1978, 1979) were similar. Possible contributors to the higher rates are that Northeast cities tend to be older than cities in other regions and hence more prone to fires resulting from building deterioration; other factors are congested population and cold winters.

Residential Fires per Thousand People by Population of Community and Year (1979, 1980)



Source: NFPA's Survey of Fire Departments for U.S. Fire Experience (1980)

AVERAGE NUMBER OF FIRES BY COMMUNITY SIZE

The average number of fires, structure fires, and residential fires by population of community for 1980 are displayed in the table below.

It is not surprising that the number of fires that occur annually in larger communities is considerably higher than the number of fires that occur annually in smaller communities. Although fire is an infrequent event in smaller communities, adequate fire protection is still important, especially in rural areas where responding distances and adequate water sources can be significant factors.

Average Number of Fires By Population of Community (1980)

Population of Community*	All Fires	Structure Fires	Residential Fires
500,000 to 999,999	10,045	2,551	1,847
250,000 to 499,999	4,334	1,542	1,015
100,000 to 249,999	1,718	612	494
50,000 to 99,999	885	291	190
25,000 to 49,999	369	132	90
10,000 to 24,999	181	70	48
5,000 to 9,999	79	30	23
2,500 to 4,999	43	17	13
under 2,500	21	8	6

Source: NFPA's Survey of Fire Departments for U. S. Fire Experience (1980).
*There was insufficient data for communities reporting in the one million or more category.

CIVILIAN FIRE DEATHS AND INJURIES

Fire is the third largest accidental cause of deaths in the United States. It claims the lives of about 7,500 civilians annually. Thousands more are injured, often by severe burns or inhalation of smoke and other toxic gases.

In addition to documenting the magnitude of fire casualties in an annual survey of U.S. fire experience, NFPA has used its data resources to identify the leading contributors to the ignition of fatal fires. The aim of such research is to help direct fire prevention and protection efforts to reduce the number of deaths and severe injuries from fire.

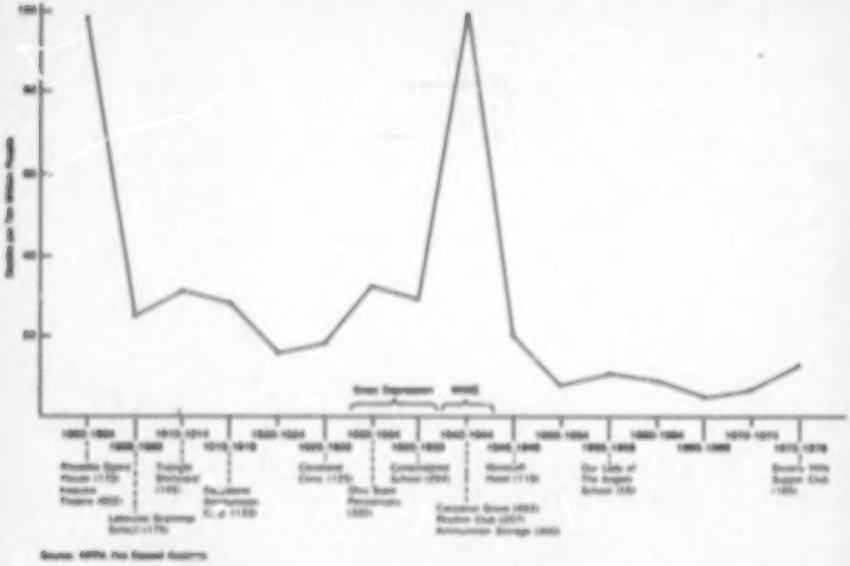
MAJOR LOSS OF LIFE IN 20th CENTURY U.S. BUILDING FIRES TAKING AT LEAST 25 LIVES

The graph on page 8 traces the twentieth century record of major loss of life building fires in America in five year periods from 1900 to 1979. The statistic displayed is deaths per ten million people in the national population and the graph is limited to building fires that killed at least 25 persons because such fires generally occur in properties addressed by legally binding fire codes and because early data are likely incomplete for fires that claimed fewer victims.

The prominent peak for the years 1940 to 1944 can partially be explained by the war emergency at the time. Although the Port Chicago, California munitions depot exploded killing 300 during this period, most of these major loss of life building fires were not directly war related. The worst such occurred in night clubs: the Cocoanut Grove in Boston where 492 were killed by fire in 1942 and the Rhythm Club in Natchez, Mississippi, where 207 people lost their lives in 1940. Other less spectacular building fires also claimed many lives during this period.

These war years presented unique problems for code enforcement and compliance. The serious hardships experienced by fire departments in maintaining authorized strengths of qualified, experienced fire fighters were prominently discussed at NFPA annual meetings of the time. Under these conditions, inspections of buildings for fire code violations would be expected to be seriously limited. Moreover, in view of wartime priorities for labor and materials, building owners would have faced serious problems in complying with codes.

Major Loss of Life in 20th Century U.S. Building Fires Taking at Least 25 Lives



SELECTED FIRES CAUSING LARGE LOSS OF LIFE

The following table lists selected large loss of life fires (10 or more deaths) and the important factors that contributed to life loss. The fires listed were selected for their fire protection significance.

Selected Major Fires Causing Large Loss of Life
(10 or more Deaths) 1900 to 1980

	PUBLIC ASSEMBLY	Deaths
Jan. 13, 1903	Rhoades Opera House, Boyertown, PA	170
Dec. 30, 1903	Iroquois Theater, Chicago, IL	602
Apr. 23, 1940	Rhythm Club, Natchez, MS	207
Nov. 28, 1942	Cocoanut Grove night club, Boston, MA	492
July 6, 1944	The Ringling Brothers and Barnum and Bailey Circus, Hartford, CT	168
Oct. 15, 1960	Indiana State Fairgrounds Coliseum, Indianapolis, IN	74
Feb. 7, 1967	Dale's Penthouse (restaurant), Montgomery, AL	25
June 24, 1973	Cockteil Lounge, New Orleans, LA (incendiary fire)	32
June 30, 1874	Conflagration, Port Chester, NY (incendiary fire in adjacent occupancy)	24
Oct. 24, 1976	Social Club, Bronx, NY (incendiary fire, blocked escape routes)	25
May 28, 1977	Supper Club, Southgate, KY (delayed alarm, rapid fire spread, overcrowding, lack of automatic sprinkler protection)	162

	EDUCATIONAL	
Mar. 4, 1908	Lakeview Grammar School, Collinwood, OH	176
Mar. 18, 1937	Consolidated School, New London, TX (gas explosion)	294
Dec. 1, 1958	Our Lady of the Angels Grade School, Chicago, IL	95
	INSTITUTIONAL	
May 15, 1929	Cleveland Clinic, Cleveland, OH	125
Apr. 21, 1930	Ohio State Penitentiary, Columbus, OH	320
Dec. 6, 1961	Hartford Hospital, Hartford, CT	16
Nov. 23, 1963	Golden Age Nursing Home, Fitchville Township, OH	63
Jan. 6, 1970	Convalescent Home, Marietta, OH (smoke spread throughout building)	32
Jan. 14, 1971	Nursing Home, Buechel, KY (lack of automatic fire protection)	10
Oct. 18, 1971	Nursing Home, Homestead, PA (lack of automatic fire protection)	15
June 6, 1975	Jail fire, Sanford, FL (blocked exit door, locked security doors)	11

Jan. 30, 1979	Nursing Home, Chicago, IL (smoke spread through open door to chapel where most residents were attending services)	24
June 26, 1977	County Jail, Columbia, TN (incendiary origin)	42
Dec. 9, 1979	Institution for Mentally Retarded, Gillette, MS (lack of automatic detection and suppression, lack of smoketop partitions)	10
Dec. 27, 1979	County Jail, Lancaster, SC (rapid fire and smoke spread, locked doors)	11

RESIDENTIAL

		Deaths
June 5, 1946	The LaSalle Hotel, Chicago, IL	61
Dec. 7, 1946	Winecoff Hotel, Atlanta, GA	119
June 6, 1948	Canfield Hotel, Dubuque, IA	19
Dec. 29, 1963	Roosevelt Hotel, Jacksonville, FL	22
June 3, 1968	Apartment House, Kansas City, MO (dumbwaiter shaft spread fire throughout building)	12
June 8, 1968	Dwelling, Parkersburg, WV (arson-gasoline spread as accelerant)	12
Mar. 28, 1970	Ozark Hotel, Seattle, WA (spread via stairways; incendiary origin)	20
Aug. 5, 1970	Apartment Building, Minneapolis, MN (doors blocked open; open stairways)	12
Sept. 13, 1970	Ponet Square Hotel, Los Angeles, CA (spread via stairways; incendiary origin)	19
Dec. 28, 1970	Pioneer Hotel, Tucson, AZ (spread via stairways; incendiary origin)	29
Apr. 25, 1971	Apartment Building, Seattle, WA (careless smoking; open stairways)	12
Jan. 16, 1972	Hotel, Tyrone, PA (open stairways; nonfirestopped walls)	12
Nov. 30, 1972	High Rise Housing for the Elderly, Atlanta, GA (delayed alarm, open apartment door, combustibility of corridor carpeting)	10
Nov. 10, 1973	Apartment House, Los Angeles, CA (open stairways)	25
Aug. 28, 1974	Hotel, Berkeley Springs, WV (unsprinklered ordinary construction; open stairways)	12
July 7, 1975	Hotel, Portland, OR (home for transients, first floor occupied by businesses, lack of automatic detection and suppression)	11
Dec. 12, 1975	Apartment Building, San Francisco, CA (incendiary fire, rapid spread through open stairways)	14
Jan. 10, 1976	Hotel, Fremont, NE (natural gas explosion)	20
Feb. 4, 1976	Tenement house, New York, NY (careless smoking, fire spread through pipe recesses)	10
Dec. 20, 1976	Apartment house, Los Angeles, CA (delay in alarm transmittal, open stairways)	10
Dec. 23, 1976	Apartment house, Chicago, IL (careless handling of liquid fuel)	12
Jan. 28, 1977	Hotel, Breckenridge, MN (lack of automatic detection and suppression, open stairways)	17
Dec. 13, 1977	Dormitory, Providence, RI (rapid spread among Christmas decorations, dead-end corridor)	10
Jan. 28, 1978	Hotel, Kansas City, MO (lack of automatic detection and suppression, unprotected vertical openings, inadequate means of egress)	20
Nov. 5, 1978	Hotel, Honesdale, PA (incendiary origin)	12
Nov. 26, 1978	Hotel, Greece, NY (incendiary origin, unprotected openings in stairways, inadequate alerting of occupants)	10
Jan. 20, 1979	Tenement, Hoboken, NJ (open stairway, lack of approved egress)	21
Apr. 1, 1979	Boarding home, Connellsville, PA (open stairways, lack of automatic detection and suppression in structure originally built as single family dwelling)	10
Apr. 2, 1979	Boarding Home, Farmington, MO (lack of complete detection system, undivided attic space, lack of training of staff and residents in fire evacuation)	25
Apr. 11, 1979	Hathway House, Washington, DC (lack of stairway enclosure, lack of second means of egress, delay in alarm and evacuation, combustible furnishings and finishes, lack of staff and resident training in fire evacuation)	10
July 31, 1979	Hotel, Cambridge, OH (open stairways, inadequate notification of occupants, combustible interior finish)	10
Nov. 11, 1979	Boarding Home, Pioneer, OH (combustible interior finish, lack of second means of egress)	14
July 26, 1960	Boarding Home; Bradley Beach, NJ (delayed alarm, lack of early warning automatic detection, unprotected vertical openings, lack of second means of egress from second and third floors)	24
Nov. 21, 1980	Hotel, Las Vegas, NV (improper electrical wiring, rapid fire and smoke development, failure to extinguish fire in incipient stage, improperly protected vertical openings, improperly enclosed exit stairs, distribution of smoke by air handling equipment)	85
Dec. 4, 1980	Hotel, Harrison, NY (lack of fire extinguishment in incipient stage, rapid fire development, lack of early warning detection and alarm)	25

STORE AND OFFICE

Apr. 5, 1968	Marting Arms (sporting goods store), Richmond, IN (gun-powder explosion)	41
Feb. 25, 1969	Office Building, New York, NY (single exit; fire flashed)	11
Feb. 3, 1970	Department Store, Eagle Grove, IA (natural gas explosion)	14
Dec. 22, 1976	Department Store, Brooklyn, NY (structural collapse, dense smoke)	12
Nov. 5, 1978	Department Store, Des Moines, IA (lack of automatic suppression)	10

BASIC INDUSTRY, UTILITY, DEFENSE

Oct. 20, 1944	East Ohio Gas Co., Cleveland, OH (gas explosion)	130
Mar. 25, 1947	Centralia Coal Co., Centralia, IL (dust explosion)	111
Dec. 21, 1951	C.W. & F. Coal Company, W. Frankfort, IL (gas explosion)	119
[illegible] 30, 1970	Coal Mine Explosion, Hyden, KY	38
May 2, 1972	Silver Mine, Kellogg, ID (toxic gases through ventilation system; inadequate breathing aids)	91
Mar. 9 and 11, 1976	Coal Mine Explosion, Oven Fork, KY (two blasts)	26

MANUFACTURING

Mar. 25, 1911	Triangle Shirtwaist Co., New York, NY	146
April 10, 1917	Eddystone Ammunition Corp., Eddystone, PA (explosion)	133
Feb. 3, 1971	Chemical Plant, Woodbine, GA (violent explosion and fire)	26
Dec. 16, 1972	Steel Plant, Weirton, WV (gas explosion in a coke oven)	21
Aug. 12, 1976	Oil Refinery Explosion, Chalmette, LA	12

Selected Major Fires Causing Large Loss of Life (Continued)

	STORAGE	
July 17, 1944	Munitions Depot, Port Chicago, CA (explosion)	300
Feb. 10, 1973	Gas Storage Tank, Staten Island, NY (polyurethane insulation)	40
Dec. 22, 1977	Grain elevator explosion, Westwego, LA	36
Dec. 27, 1977	Grain elevator explosion, Galveston, TX	18
	SPECIAL	
June 15, 1904	Excursion steamer, General Slocum, Hell Gate Passage, East River, New York, NY	1,030
Sept. 8, 1934	S.S. Morro Castle, off New Jersey Coast	125
Apr. 16, 1947	S.S. Grandcamp, Texas City, TX (ammonium nitrate explosion)	468
Feb. 25, 1969	Twin Engine Beechcraft, Port Angeles, WA (stalled, crashed, and burned)	10
Mar. 20, 1969	DC 3 Charter Plane, Kenner, LA (crashed in heavy fog and burned)	13
Apr. 6,1969	S.S. Union Faith, Mississippi River at New Orleans, LA (collided with oil barges)	25
Nov. 28, 1970	DC 8 Charter, Anchorage, K (crashed on takeoff)	47
June 7, 1972	Convair 580, East Haven, CT (low landing approach, hit houses)	28
June 24, 1971	Water Project, Sylmar, CA (ignition of methane by drill)	16
Nov. 15, 1971	C 130, Little Rock, AR (crashed during landing)	11
Dec. 11, 1971	Water Tunnel, Port Huron, MI (ignition of methane gas by drill)	21
Feb. 1, 1972	Tank Ship Y. A. Fogg, Galveston, TX (explosion caused by lightning)	39
Sept. 24, 1972	Ice Cream Parlor, Sacramento, CA (jet plane crashed into structure)	22
July 5, 1973	Rail Tank Car, Kingman, AZ (fire during unloading operations)	13
July 31, 1973	Aircraft Crash, Boston, MA (instrument landing in fog)	46
Apr. 9, 1974	Oil Tanker, Tinicum Township, PA (explosion during unloading)	11
Jan. 31, 1975	Ship Collision, Marcus Hook, PA (chemical cargo ship and oil tanker collision, several explosions, fire spread to dock area)	29
Apr. 30, 1975	LP-Gas Transport Truck Explosion, Eagle Pass, TX (truck overturned, ruptured, and a section propelled into several mobile homes)	19
June 24, 1975	B-727 Airplane crash and fire, New York, NY (crashed during severe storm on landing, spilled fuel ignited)	113
Apr. 27, 1976	B-727 Airplane crash and fire, St. Thomas, Virgin IS	35
Apr. 4, 1977	DC-9 Airplane crash and fire, New Hope, GA	28
Feb. 24, 1978	Train derailment, Waverly, TN (LP-Gas tank car BLEVED)	16
Nov. 5, 1979	Ship collision, Galveston, TX (oil tanker and freighter collided)	32

WHERE CIVILIAN FIRE DEATHS OCCUR

Estimates of total U.S. civilian fire deaths for the period 1977–1980 indicate that on the average 7,500 civilians died annually from fire. From 1978 to 1980, the number of civilian fire deaths decreased from 8,130 civilian fire deaths in 1978 to 6,505 civilian fire deaths in 1980. This difference is mostly due to a large decrease in vehicle fire deaths, a highly variable fire statistic from year to year.

From 1977 to 1980, the number of civilian fire deaths in the home (one- and two-family dwellings and apartments) decreased 11.3% from 5,865 civilian fire deaths in 1977 to 5,200 in 1980. (Trends in home fire deaths are discussed more fully in the next section. Although the number of home fire deaths has decreased in recent years, it should be kept in mind that fires in residential properties accounted for over 78% of all fire deaths during this four year period.

The number of civilian deaths due to fires in vehicles varied considerably over the four year period. This is probably due to two factors: (a) the difficulty in determining whether a death in a vehicle fire when a collision is involved resulted from impact or the fire itself, and (b) the facts that reported vehicle fire deaths are a rare occurrence for the smallest communities and that vehicle fire death rates can vary considerably for the smallest communities from year to year.

About 12% of all civilian fire deaths in structures occurred as a result of incendiary or suspicious fires over the 1977–1980 period.

The table that follows shows the properties where U.S. civilian fire deaths occur.

Estimates of U.S. Civilian Fire Deaths by Selected Property Use Breakdowns and Year (1977–1980)

Property Use	1977 Number	1977 Percent of all Civilian Deaths	1978 Number	1978 Percent Change from 1977	1978 Percent of all Civilian Deaths
Residential (Total)	6,135	80.8	6,185	+0.8	76.1
One- and Two-Family Dwellings*	4,835	63.7	4,945	+2.3	60.8
Apartments	1,030	13.6	1,070	+3.9	13.2
Hotels and Motels	155	2.0	130	−13.3	1.6
Other Residential	115	1.5	40	−65.2	0.5
Vehicles**	740	9.8	1,255	+69.6	15.4
All Other Categories	710	9.4	690	−2.8	8.5
Total	7,585		8,130	+7.1	

Property Use	1979 Number	1979 Percent Change from 1978	1979 Percent of all Civilian Deaths	1980 Number	1980 Percent Change from 1979	1980 Percent of all Civilian Deaths
Residential (Total)	5,765	−6.8	74.1	5,446	−5.5	83.7
One- and Two-Family Dwellings*	4,320	−12.6	55.5	4,175	−3.3	64.2
Apartments	1,180	+10.3	15.2	1,025	−13.1	15.7
Hotels and Motels	140	+7.7	1.8	165	+17.8	2.5
Other Residential	125	+212.5	1.6	81	−35.2	1.3
Vehicles**	1,535	+22.3	19.7	740	−51.8	11.4
All Other Categories	480	−30.4	6.2	319	−33.5	4.9
Total	7,780	−4.3		6,505	−16.4	

*Includes mobile homes.

**This category includes highway vehicles, trains, boats, ships, aircraft, farm vehicles, and construction vehicles.

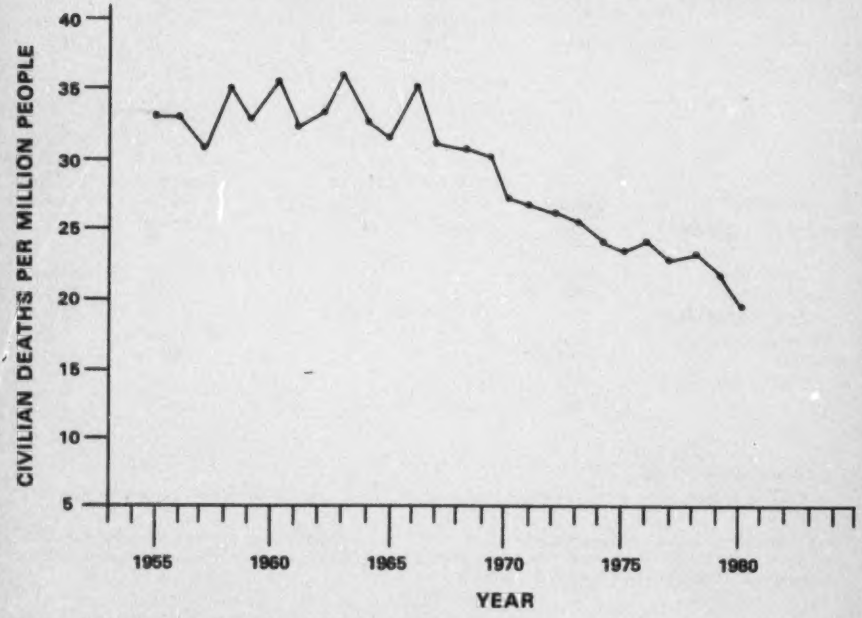
The estimates are based on data reported to the NFPA by fire departments that responded to the 1977, 1978, 1979, and 1980 NFPA National Fire Experience Surveys; for 1980 adjustments were made based on data reported to the NFPA in the FIDO System.

TRENDS IN CIVILIAN FIRE DEATHS IN THE HOME

The graph below presents civilian fire death rates in the home in the United States (1955–1980) based on fire fatalities compiled by the National Safety Council.

Since 1967, the civilian death rate from home fires has been gradually declining from a rate of 31.7 deaths per million to 19.4 deaths per million in 1980. In particular, the most recent decline in the 1977–80 period (as noted in the preceding section) may be the result of increased use of smoke detectors and public awareness resulting from home fire safety education efforts.

Civilian Deaths Per Million People in the Home (1955–1980)



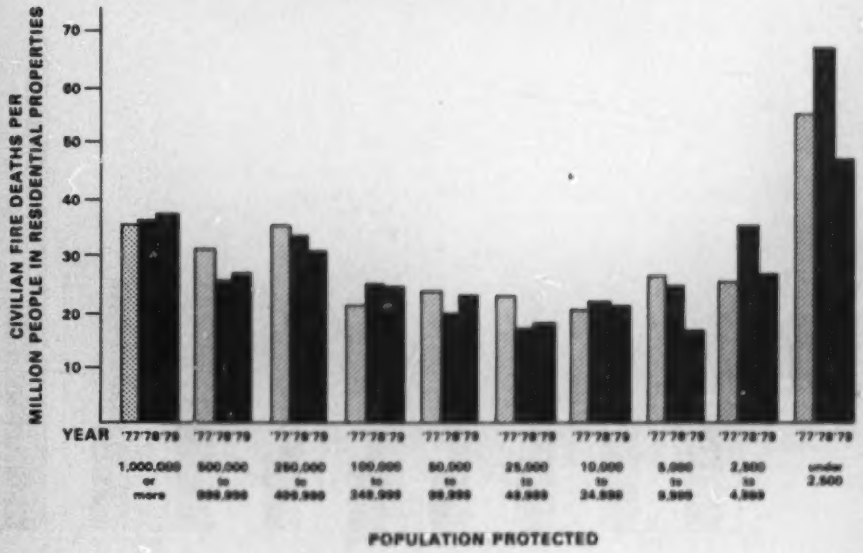
Source: National Safety Council and U.S. Census Bureau.

RESIDENTIAL CIVILIAN FIRE DEATHS BY COMMUNITY SIZE AND YEAR

The figure below displays residential civilian fire deaths per million population in residential properties by population of community and year (1977–1979).

By community size, the largest and the smallest communities had the highest fire death rates for all years.

Civilian Fire Deaths per Million People in Residential Properties by Population Protected and Year (1977–79)

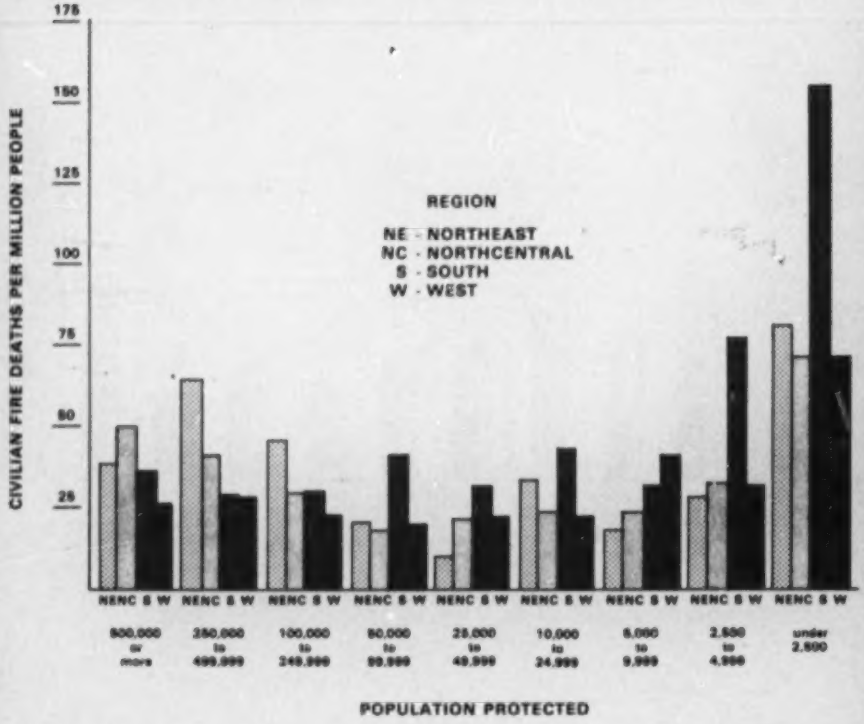


CIVILIAN FIRE DEATH RATES BY COMMUNITY SIZE AND REGION

The figure below displays civilian fire deaths per million population by community size and region of the country (1979).

The South experienced higher civilian fire death rates than the other regions for virtually all community sizes under 100,000 population, while the Northeast experienced the highest death rates for communities with populations of 100,000 to 499,999. Analysis of data from 1978 and 1980 has also indicated that the South and Northeast experience the highest fire death rates.

Civilian Fire Death Rates by Community Size and Region of the Country (1979)



WHERE CIVILIAN FIRE INJURIES OCCUR

Based on a survey of public fire departments, annual estimates of U.S. civilian fire injuries for the 1977–1980 period indicate little change from year to year and that on the average, a reported 30,600 civilians are injured annually. Over the four year period, residential fires accounted for about 70% of all civilian injuries reported to fire departments.

It should be noted that estimates of civilian injuries are probably on the low side due to underreporting of civilian injuries to public fire departments (*e.g.*, minor injuries that did not need immediate medical attention or small fires that involved an injury where the fire department did not attend).

The table below shows the properties where U.S. civilian fire injuries occur.

Estimates of Civilian Injuries in the United States by Selected Property Use Breakdowns and Year (1977–1980)

	Civilian Injuries					
	1977		1978			
Property Use	Number	Percent of all Civilian Injuries	Number	Percent Change from 1977	Percent of all Civilian Injuries
Residential (Total)	22,600	72.4	21,275	−5.9	71.4
One- and Two-Family Dwellings*	17,465	56.0	15,400	−11.8	51.7
Apartments	4,175	13.4	5,000	+19.8	16.8
Hotels and Motels	575	1.8	600	+4.3	2.0
Other Residential	385	1.2	275	−28.6	0.9
Vehicles**	3,515	11.3	3,700	+5.3	12.4
All Other Categories	5,075	16.3	4,825	−4.9	16.2
Total	31,190		29,800	−4.4	

	1979			1980		
Property Use	Number	Percent Change from 1978	Percent of all Civilian Injuries	Number	Percent Change from 1979	Percent of all Civilian Injuries
Residential (Total)	20,450	−3.8	65.3	21,000	+3.2	69.9
One- and Two-Family Dwellings*	14,650	−4.8	46.8	16,100	+9.9	53.3
Apartments	4,175	−16.5	13.3	3,600	−13.8	11.9
Hotels and Motels	1,225	+104.1	3.9	1,075	−12.2	3.6
Other Residential	400	+45.5	1.3	325	−18.8	1.1
Vehicles**	5,175	+39.8	16.5	4,075	−21.3	13.5
All Other Categories	5,700	+18.1	18.2	5,025	−11.8	16.6
Total	31,325	+5.1		30,200	−3.6	

*Includes mobile homes.

**This category includes highway vehicles, trains, boats, ships, aircraft, farm vehicles, and construction vehicles.

The estimates are based on data reported to the NFPA by fire departments that responded to the 1977, 1978, 1979, and 1980 NFPA National Fire Experience Surveys; adjustments were made based on data reported to the NFPA in the FIDO System.

AVERAGE CIVILIAN DEATHS AND INJURIES BY COMMUNITY SIZE

The table below displays the average number of civilian deaths and injuries that occurred by population of community (1980).

Not surprisingly, the larger the population, the higher the number of civilian deaths and injuries. Fortunately, fire casualties are a rare occurrence for the smaller communities. For communities less than 50,000 population, the average number of civilian deaths was less than one in all population ranges. In particular, 19 out of 20 communities under 2,500 population reporting in NFPA's 1980 fire experience survey did not experience a fire death. It should be kept in mind though, that when civilian deaths per million people by community size are examined, the smallest communities have the highest rates.

Average Number of Civilian Deaths and Injuries By Population of Community (1980)

Population of Community*	Civilian Deaths	Civilian Injuries
500,000 to 999,999	18.24	96.10
250,000 to 499,999	9.68	55.56
100,000 to 249,999	3.86	17.31
50,000 to 99,999	1.64	7.18
25,000 to 49,999	.73	3.84
10,000 to 24,999	.33	1.96
5,000 to 9,999	.19	.87
2,500 to 4,999	.07	.40
Under 2,500	.05	.21

Source: NFPA's Survey of Fire Departments for U.S. Fire Experience (1980).
*There was insufficient data for communities reporting in the one million or more category.

INTERNATIONAL FIRE DEATHS AND INJURIES

In 1980, NFPA obtained current statistics on international fire losses through a special survey of 26 countries that were mostly members of the Conference of Fire Protection Associations. The table that follows displays fire death and injury rates which include both civilians and fire fighters for selected countries.

Although the table shows the U.S. had a rate of 3.80 fire deaths per 100,000 persons, the highest among European and North American countries, when deaths are examined relative to overall fire experience, the U.S. was among the lowest (2.94 deaths per 1,000 fires and 7.81 per 1,000 structure fires).

Comparison of international fire losses is helpful in analyzing the worldwide fire problem. However, in considering the statistics shown here, it should be noted that the lack of standard definitions, methods of reporting, and methods of estimating fire losses creates difficulty in making direct comparisons and interpreting their significance. In addition, other variables such as cultural and socio-economic conditions, climate, and building construction make comparisons between countries difficult. These limitations must be kept in mind when examining these statistics.

Fire Death and Injury Rates for Selected Countries

	Reported Number of Deaths per 100,000 Persons	Reported Number of Deaths per 1,000 Fires	Reported Number of Deaths per 1,000 Structure Fires	Reported Number of Injuries per 100,000 Persons	Reported Number of Injuries per 1,000 Fires	Reported Number of Injuries per 1,000 Structure Fires
EUROPE						
Belgium	2.83	16.42	21.62	15.42	89.36	117.84
Denmark	0.96	2.63	3.40	N/A	N/A	N/A
Finland	2.16	6.66	12.92	N/A	N/A	N/A
France	0.56	2.50	N/A	3.72	16.48	N/A
Germany[2]	1.83	6.96	N/A	N/A	N/A	N/A
Netherlands[2]	0.90	4.52	10.10	5.83	32.70	73.26
Norway	1.65	4.04	N/A	N/A	N/A	N/A
Sweden	1.70	N/A	N/A	24.14	N/A	N/A
Switzerland	0.69	1.06	N/A	N/A	N/A	N/A
United Kingdom[2]	1.52	2.60	9.46	11.40	19.49	40.96
NORTH AMERICA						
Canada	3.58	11.21	N/A	N/A	N/A	N/A
United States	3.90	2.94	7.81	62.58	46.52	128.72
ASIA						
Hong Kong	0.84	2.77	5.75	12.66	94.90	114.12
Japan[2]	1.87	29.84	48.57	7.47	132.96	216.43
Korea	0.64	41.76	N/A	2.28	149.43	N/A
Singapore	3.87	21.80	86.36	N/A	N/A	N/A
THE PACIFIC						
Australia[3]	1.15	2.13	N/A	N/A	N/A	N/A
New Zealand	1.97	2.96	7.56	6.98	9.14	26.89
AFRICA						
South Africa	0.64	10.48	45.36	0.90	14.62	63.31

Based on data from 1978 except where noted. Information was obtained from a 1980 survey of fire protection associations conducted by the NFPA except for Japan (source: *White Book on the Fire Service in Japan*, Fire Defense Agency, November 1978); Canada (source: *1978 Fire Losses in Canada*, Report of the Dominion Fire Commissioner, Ottawa, 1980); Australia (source: *Fire Protection*, Fire Protection Association of South Africa, March 1980); and Singapore (source: *Singapore Fire Brigade Annual Report*, 1978).

[1] Death and injury rates include both civilians and fire fighters.

[2] German Federal Republic.

[3] Based on data from 1977; later data were not available.

MULTIPLE-DEATH FIRES

Multiple-death fires (those fires that kill three or more people) account for a small fraction of total fires but result in a disproportionate number of deaths. In 1980, there were 322 multiple-death fires that resulted in 1,348 fatalities. Although these deaths were 20.3% of the estimated 6,505 total deaths that occurred in 1980, they occurred in only .01% of the 2,988,000 total fires.

NUMBER OF MULTIPLE-DEATH FIRES BY YEAR

The table below displays the distribution of multiple-death fires and associated deaths for the years 1976–1980.

During the period 1976–1979, the number of multiple-death fires has remained fairly constant, with a slight increase in 1980.

Multiple-Death Fires, 1976–1980

Year	*Number of Multiple-Death Fires*	*Number of Deaths in Multiple-Death Fires*	*Fires Causing 10 or More Deaths*	*Deaths in Fires Killing 10 or More*
1980	322	1,348*	6	168*
1979	282	1,119	8	124
1978	290	1,161	7	95
1977	294	1,505**	8	326**
1976	290	1,216	9	151

*Includes 85 deaths in the MGM Grand Hotel fire.

**Includes 165 deaths in the Beverly Hills Supper Club fire.

Note: The information presented in this Table for 1976 to 1979 differs from previously published statistics due to the updating of NFPA data files as additional information becomes available.

Distribution of Multiple-Death Incidents By Number of Deaths, 1977–1980

	Number of Deaths	10 or more	9	8	7	6	5	4	3
1980	Number of Fires	6	1	3	8	18	27	71	188
	Percent of Total Fires	1.9	0.3	0.9	2.5	5.6	8.4	22.0	58.4
1979	Number of Fires	7	1	2	7	9	24	49	172
	Percent of Total Fires	2.6	0.3	0.7	2.6	3.3	8.9	18.1	63.5
1978	Number of Fires	7	1	4	8	15	35	54	162
	Percent of Total Fires	2.5	0.4	1.4	2.8	5.2	12.2	18.9	56.9
1977	Number of Fires	8	1	1	5	14	22	74	141
	Percent of Total Fires	2.9	1.5	1.5	1.8	5.1	8.1	27.2	51.9

Fires Resulting in 10 or More Deaths

Property	Location	Date	Number of Deaths
	1980		
Hotel*	Las Vegas, Nev.	11/21	85 deaths
Hotel meeting facility*	Harrison, N.Y.	12/4	26 deaths
Boarding facility*	Bradley Beach, N.J.	7/26	24 deaths
Apartment building	Salt Lake City, Utah	12/18	12 deaths
Metal products mfg. plant	New York, N.Y.	7/25	11 deaths
Apartment building	Chicago, Ill.	10/28	10 deaths
	1979		
Ship	Galveston, Tex.	11/5	32 deaths
Boarding facility*	Farmington, Mo.	4/2	25 deaths
Apartment building*	Hoboken, N.J.	1/20	21 deaths
Boarding facility*	Pioneer, Ohio	11/11	14 deaths
Jail*	Lancaster, S.C.	12/27	11 deaths
Boarding facility	Connellsville, Pa.	4/1	10 deaths
Boarding facility*	Washington, D.C.	4/11	10 deaths
Hotel*	Cambridge, Ohio	7/31	10 deaths
	1978		
Hotel*	Kansas City, Mo.	1/28	20 Deaths
Train Derailment*	Waverly, Tenn.	2/24	16 Deaths
Institution for Mentally Retarded*	Ellisville, Miss.	12/29	15 Deaths
Hotel*	Honesdale, Pa.	11/5	12 Deaths
Tenement	Newark, N.J.	12/7	12 Deaths
Department Store*	DesMoines, Iowa	11/5	10 Deaths
Hotel*	Greece, N.Y.	11/26	10 Deaths
	1977		
Supper club†	Southgate, Ky.	5/28	165 Deaths
Prison†	Columbia, Tenn.	6/26	42 Deaths
Grain elevator†	Westwego, La.	12/22	36 Deaths
Aircraft crash	New Hope, Ga.	4/4	28 Deaths*
Grain elevator†	Galveston, Tex.	12/27	18 Deaths
Hotel	Breckenridge, Minn.	1/28	17 Deaths
Hotel	Bay City, Mich.	12/10	10 Deaths
College dormitory†	Providence, R.I.	12/13	10 Deaths
	1976		
Coal mine explosions*	Oven Fork, Ky.	3/9 & 3/11	26 Deaths
Social club fire†	Bronx, N.Y.	10/24	25 Deaths
Nursing home fire†	Chicago, Ill.	1/30	24 Deaths
Hotel fire†	Fremont, Nebr.	1/10	20 Deaths
Oil refinery fire	Chalmette, La.	8/12	12 Deaths
Department store fire	Brooklyn, N.Y.	12/22	12 Deaths
Apartment house fire	Chicago, Ill.	12/23	12 Deaths
Apartment house fire	Manhattan, N.Y.	2/4	10 Deaths
Apartment house fire†	Los Angeles, Calif.	12/20	10 Deaths

* Investigations determined that of the 71 deaths in this incident, 28 were fire-related.

† Investigated by NFPA staff.

* For the purposes of this study, these two related explosions have been counted as a single multiple-death incident.

† Investigated by NFPA staff members.

WHERE MULTIPLE-DEATH FIRES OCCUR

The table below displays the number of multiple-death fires and the associated deaths by fixed property use and by year (1977–1980).

Residential properties accounted for 89% of the multiple-death fires, and 82% of the associated deaths during the four year period.

Multiple-Death Fires by Fixed Property Use

Property	Number of Fires				Number of Deaths			
	1977	1978	1979	1980	1977	1978	1979	1980
PUBLIC ASSEMBLY:								
Bathhouse	1				9			
City Club		1		1		3		3
Church, Chapel				2				7
Hotel Meeting Facility				1				26
Nightclub*	1				165			
Theater	1				9			
Tavern			1				7	
TOTAL	3	1	1	4	183	3	7	36
INSTITUTIONAL:								
Care of the Aged, Group Care Facility†		3				11		
Prisons	2		1		47		11	
Mental Institution	1	1			4	15		
TOTAL	3	4	1		51	26	11	
RESIDENTIAL								
1- and 2-Family Dwellings	142	152	162	187	536	555	575	681‡
Apartments, Tenements, etc.	53	59	39	55	199‡	246‡	160	224‡
Room & Boarding Houses	6	2	6	6	23	6	73	42
Hotels and Motels	13	13	7	7	81	86	33	106
Dormitory	1			1	10			5
Home Hotels				2				10
Mobile Homes	26	27	26	27	91	104	98	98
Treehouse	1				3			
TOTAL	241	253	244	285	943	997	939	1166
STORE AND OFFICE PROPERTY:								
Department Store		1				10		
Supermarket		1				6§		
Other Mercantile		1		1		4		3
Clothing Store			1				5§	
Motor Vehicle Service and Repair			2	2			10	6
TOTAL		3	3	3		20	15	9
BASIC INDUSTRY:								
Coal Mine	1			1	4			5
Oil Wells	2			1	7			6
Salt Mine			1				5	
TOTAL	3		1	2	11		5	11
MANUFACTURING:								
Grain Mills		1				3		
Chemical	4	4		3	14	13		13
Metal and Metal Products			1	1			3	11
Paper				1				7
Refineries		2	3			10	10	
TOTAL	4	7	4	5	14	26	13	31

Multiple-Death Fires by Fixed Property Use (Continued)

Property	Number of Fires				Number of Deaths			
	1977	1978	1979	1980	1977	1978	1979	1980
STORAGE:								
Grain Elevators	3	1		1	57	3		3
Chemical Products	1				6			
Other Storage		1		1		3		3
Paper Products				1				5[e]
TOTAL	4	2		3	63	6		11
SPECIAL PROPERTIES:								
Hunting Camp Shelter	1				4			
Brush	3		2	2	11[f]		10[g]	7
Rail Transport		1		1		16[h]		3
Road Transport	9	12	9	12	34	52	30	51
Air Transport	1	3		3	28	12		17
Renovated Bldg./Vacant			1	1			3[i]	6
Water Transport			5				51	
TOTAL	14	16	17	18	77	80	94	78
TOTAL	272	286	271	322	1,342	1,156	1,084	1,348

[f] Includes 4 fire fighters
[g] Includes 1 fire fighter
[h] Includes 6 fire fighters
[i] Includes 2 fire fighters
[e] Includes 3 fire fighters

*Beverly Hills Supper Club Fire, Southgate, Kentucky.
†The three fires and 11 deaths in 1978 were in boarding homes and group care facilities. Some form of supervision, but no nursing care, was provided. The occupants were aged, or had physical or mental impairment.

MULTIPLE-DEATH FIRES IN BOARDING FACILITIES

Since 1978 there have been 12 multiple-death fires and 141 deaths in residential facilities primarily used to house individuals with special needs. These facilities may be known by many names: foster homes, group care homes, boarding homes, halfway houses, houses for the aged, sheltered care homes. The common factor for each of the facilities is that, although the residents are largely capable of self-care, they require supervision and some supportive care. The residents may be elderly, suffer from mental disorders, or various physical problems. Some may have been placed in a facility as part of a program of deinstitutionalization. Many are incapable of proper response to a fire emergency.

Often these facilities are housed in structures originally built for another use, such as old hotels and rooming houses or single-family dwellings. Common problems encountered in these fires are limited exits, unenclosed horizontal and vertical openings, combustible interior finish, and inadequate fire detection and alarm systems. In many states these facilities operate outside the jurisdiction of local code enforcement officials; in fact, these officials may not even know that the facility is in their community. In addition, such facilities often operate with limited staff who have little or no training in emergency procedures. The table on the next page lists some boarding facility fires for 1978–1981.

Multiple-Death Fires in Boarding Facilities (Halfway Houses)
1978–1981

Date	Location	Number of Deaths[1]
2-1-78	Nashville, TN	4
4-16-78	San Francisco, CA	3
5-13-78	Athens, TX	4
7-5-78	Asbury park, NJ	4
4-1-79	Connellsville, PA	10
4-2-79	Farmington, MO	25
4-11-79	Washington, DC	10
11-11-79	Pioneer, OH	14
7-26-80	Bradley Beach, NJ	24
11-30-80	Detroit, MI	5
1-9-81	Keansburg, NJ	31
2-3-81	Point Pleasant Beach, NJ	7

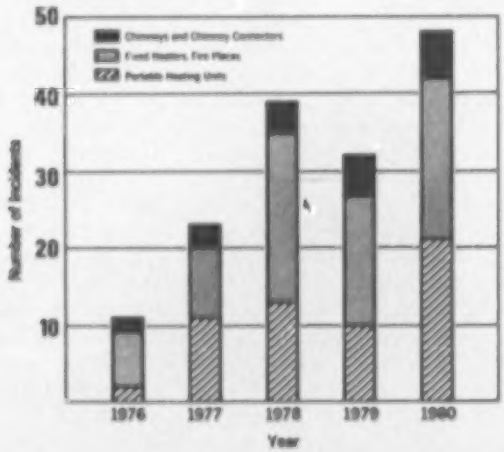
[1] Civilian Deaths

AUXILIARY HEATING RELATED MULTIPLE-DEATHS

The figure below displays residential multiple-death fires ignited by auxiliary heating equipment for the years 1976 to 1980.

The figure is divided into fires that resulted from wood or coal fueled stoves and fireplaces, chimneys, and chimney connectors, and portable heating units. All three categories show an increase over the last five years. The 1980 figures show the largest number of multiple-death fires from auxiliary heating in the five year period. These results are most likely related to the extreme cold weather in the Northeast and North Central parts of the nation during the last two months of 1980. In addition, high energy costs and an increased use of auxiliary heating devices probably added to the number of fires.

Auxiliary Heating Related Multiple-Death Fires, 1976–1980

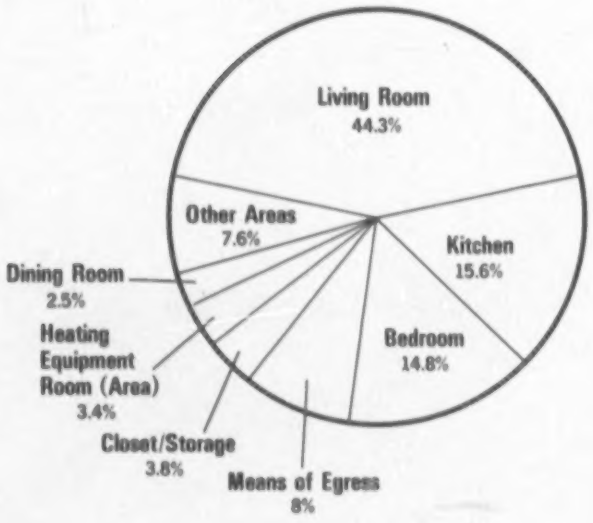


AREA OF ORIGIN IN MULTIPLE-DEATH FIRES

The figure below displays the area of origin of multiple-death fires in residential properties (1980).

The living room (44.3%), kitchen (15.6%), and bedroom (14.8%) are the locations where most of the multiple-death fires in residential properties started in 1980. Results for earlier years were similar.

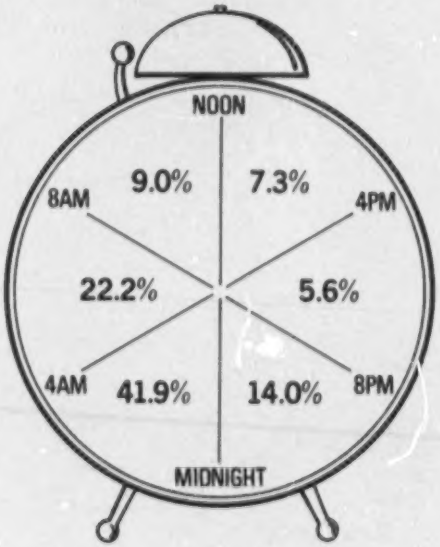
Area of Origin of Multiple-Death Fires in Residential Properties for 1980 Based Upon 237 Fires



TIME DISTRIBUTION OF MULTIPLE-DEATH FIRES

The figure below displays the time distribution of multiple-death fires in residential properties for 1980. Most of the fires (78.1%) occurred between the hours of 8:00 p.m. and 8:00 a.m., the hours when most people sleep. Results for 1978 and 1979 were similar.

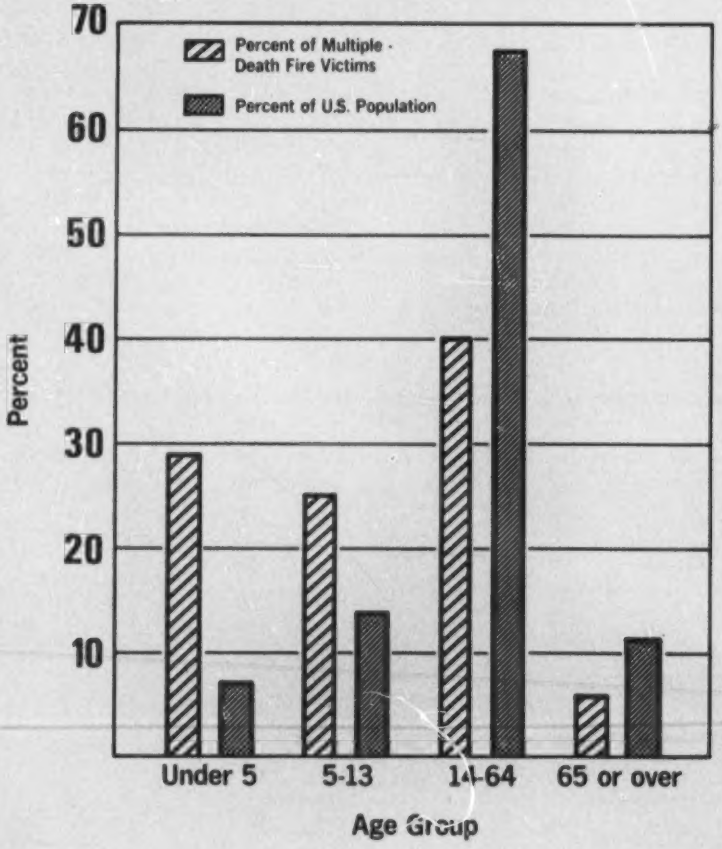
Time Distribution of Residential Multiple-Death Fires for 1980 (Based Upon 234 Fires)



AGES OF VICTIMS IN MULTIPLE-DEATH FIRES

The figure below compares the ages of victims of multiple-death fires to ages in the general population (1980). Children under 5 and in the 5–13 age group accounted for a disproportionate number of multiple-death fire victims when compared to their proportion in the total U.S. population. Analysis for the years 1977 to 1979 indicated similar findings.

1980 Multiple-Death Fires, Ages of Victims Compared to Ages in the General Population



HOW FATAL FIRES START

Scenario analysis has led to a better understanding of the ignition of fatal fires. A fire scenario is a chain of events bringing together a source of heat and a combustible material under conditions suitable for ignition. When the most frequently occurring scenarios are identified, ways to interrupt the chain to prevent fires can be developed.

IGNITION SCENARIOS OF ONE- AND TWO-FATALITY FIRES

The table below summarizes ignition scenarios for fires resulting in one or two fatalities for the years 1971 to 1978. A small number of fatal ignition scenarios recur frequently and contribute to the largest proportion of deaths. Of those scenarios, the top 18 represented nearly 53% of the fire deaths. Further, the top two ignition scenarios accounted for 32% of the 5,405 deaths.

In the top two scenarios, cigarettes ignited upholstered furniture in living areas and bedding in sleeping areas. Heating and cooking equipment are frequent sources of heat, accounting for about 8% of the deaths. The third-ranking scenario, ignition of fuel in highway motor vehicle crashes, accounted for about 4% of the deaths.

Leading Ignition Scenarios for One- and Two-Fatality United States Fires, 1971-1978

Both Accidental and Incendiary and Suspicious Fires Are Included
(Out of 780 distinct scenarios, 52.6 percent of the deaths were concentrated in the 18 scenarios listed below)

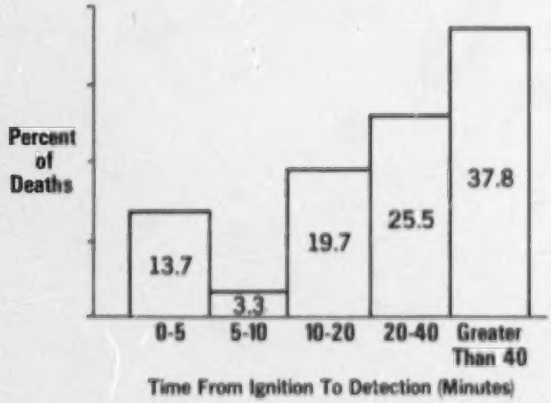
Heat of Ignition	Material Ignited	Area of Origin	Percent of Deaths	Percent of Fires
Cigarette	Upholstered furniture	Living area	17.3	16.9
Cigarette	Bedding	Sleeping area	14.7	15.5
Highway motor vehicle crash	Fuel	Vehicle fuel tank	3.9	3.7
Match, lighter, candle	Bedding	Sleeping area	2.3	2.2
Heating, cooking equipment	Structural component	Living area	1.7	1.5
Cooking equipment	Clothes on a person	Kitchen	1.5	1.8
Cooking equipment	Cooking materials	Kitchen	1.4	1.6
Cigarette	Upholstered furniture	Sleeping area	1.4	1.4
Heating, cooking equipment	Fuel	Kitchen	1.2	1.3
Highway motor vehicle crash	Gasoline, LP-Gas	Truck cargo area	1.1	1.1*
Cigarette	Bedding	Living area	0.9	0.9
Heating, cooking equipment	Fuel	Living area	0.8	0.9
Match, lighter, candle	Upholstered furniture	Living area	0.8	0.7
Match, lighter, candle	Soft goods other than bedding or clothes on a person	Sleeping area	0.8	0.7
Match, lighter, candle	Clothes on a person	Sleeping area	0.7	0.8
Cigarette	Clothes on a person	Sleeping area	0.7	0.8
Heating equipment	Fuel	Heating equipment area	0.7	0.7
Match, lighter, candle	Fuel	Living area	0.7	0.8

Based on 5,405 civilian deaths in 4,493 one- and two-fatality fires with known ignition scenarios in the NFPA FIDO data.
All percents in this Table refer to this data set.
Out of 780 distinct scenarios in this data set, the 18 scenarios in this Table accounted for 52.6 percent of the deaths and 53.1 percent of the fires.
*The fires in this scenario are generally dramatic and are particularly well reported. For this reason, it is possible that the scenario is over-represented in the data. Further research will clarify this question.

TIME FROM IGNITION TO DETECTION IN FATAL FIRES

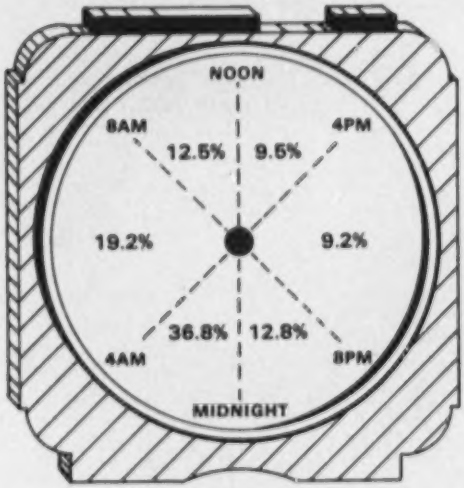
The figure below displays the time from ignition to detection in residential one- and two-fatality fires. Many of the deaths occurred in fires that had large headstarts — over 40 minutes before discovery for 38% of the deaths. This means that in many instances the fires are not discovered in time for residents to escape or that the fire department did not have sufficient time to respond and rescue the occupants.

Deaths in Residential One- and Two-Fatality Fires by Time from Ignition to Detection



Time Distribution for Deaths in Residential One- and Two-Fatality Fires

This figure displays the time distribution of deaths in residential one- and two-fatality fires (1971–1978). Over two-thirds of the 7,288 deaths reported occurred between the hours of 8 p.m. and 8 a.m. in fires that ignited and developed at night, trapping sleeping occupants.



HOW MULTIPLE-DEATH FIRES START

The table below displays accidental ignition scenarios for multiple-death fires (1971–1980). As in other studies of ignition scenarios in residential properties, fires resulting from cigarette ignitions are the most common. Of the fires studied, 27% involved cigarettes as the form of heat of ignition. Fires started by electrical equipment or solid-fuel heating devices were the next most common.

Accidental Ignition Scenarios for Multiple-Death Fires in Residential Properties (1971 to 1980)

Form of Heat of Ignition	*Area of Origin*	*Form of Material Ignited*	*Percentage of Total Fires*	*Percentage of Deaths*
Cigarette	Living room	Upholstered furniture	18.8	18.3
Cigarette	Bedroom	Bedding	6.5	6.3
Heat from solid-fueled equipment	Living room	Structural component	3.5	3.4
Electrical equipment, arcing or overloaded	Concealed ceiling space	Structural component	3.1	3.0
Electrical equipment, arcing or overloaded	Living room	Structural component	2.6	2.3
Match	Bedroom	Bedding	2.0	1.7
Heat from gas-fueled equipment	Kitchen	Cooking materials	1.4	1.6
Cigarette	Kitchen	Trash	1.3	1.2
Match	Living room	Upholstered furniture	1.3	1.1
Heat from gas-fueled equipment	Kitchen	Gas leak or spill	1.3	1.1
Hot object	Bedroom	Bedding	1.0	1.0
Electrical equipment, arcing or overloaded	Kitchen	Structural component	1.0	0.9
Cigarette	Living room	Bedding	0.9	0.9
Electrical equipment, arcing or overloaded	Living room	Wire insulation	0.9	0.8
Cigarette	Bedroom	Upholstered furniture	0.9	0.8
Heat from solid-fueled equipment	Kitchen	Structural component	0.9	0.8
Hot object	Living room	Structural component	0.9	0.8
Candle	Bedroom	Bedding	0.8	0.8
Heat from solid-fueled equipment	Living room	Upholstered furniture	0.8	0.8
Electrical equipment, arcing or overloaded	Living room	Christmas tree	0.6	0.9
Hot object	Bedroom	Upholstered furniture	0.6	0.7
Electrical equipment, arcing or overloaded	Bedroom	Bedding	0.6	0.7
Heat from liquid-fueled equipment	Living room	Fuel	0.6	0.7
Heat from solid-fueled equipment	Bedroom	Structural component	0.6	0.7
Candle	Bedroom	Soft goods (other than bedding)	0.6	0.6
Heat from gas-fueled equipment	Kitchen	Structural component	0.6	0.6
Candle	Bedroom	Upholstered furniture	0.6	0.5
Electrical equipment, arcing or overloaded	Living room	Upholstered furniture	0.6	0.5
Hot object	Kitchen	Food	0.6	0.5

These scenarios are based upon a study of 802 multiple-death residential fires reported to be of accidental origin. The fire incidents were selected because they contained complete ignition sequence information. The fires used in this study resulted in 3,139 civilian deaths and 14 fire-fighter deaths.

All classifications used in this Table are based upon NFPA 901—1976, *Uniform Coding for Fire Protection*.

HOW ONE- AND TWO-FATALITY FIRES IN ONE- AND TWO-FAMILY DWELLINGS START

The next three tables present leading accidental ignition scenarios for one- and two-fatality fires in one- and two-family dwellings grouped by ignition factor. When misuse of heat of ignition was examined, careless handling of cigarettes and open flames (matches, lighters, and candles) accounted for nearly 72% of 1,826 deaths. When mechanical failure or malfunction was examined, the leading scenario involved electrical equipment that ignited floor coverings or upholstered furniture. The ignition of clothing on a person using cooking equipment in the kitchen was the leading scenario where the ignition factor was misuse of the material ignited.

One- and Two-Family Dwellings

IGNITION FACTOR: Mechanical failure, malfunction

Heat of Ignition	Material Ignited	Area of Origin	Percent of Deaths	Percent of Fires
Electric cord, plug, switch, outlet, lighting fixture arcing or overloaded	Floor covering	Living room	4.2	4.3
	Floor covering	Bedroom	2.2	2.2
	Upholstered furniture	Living room	2.0	1.8
Heating, cooking equipment	Fuel	Kitchen	2.8	2.5
	Fuel	Living room	2.4	2.5
Fixed electric wiring arcing or overloaded	Structural member	Living room	2.2	1.8
Heating system	Fuel	Heating equipment area	2.0	2.0
	Structural member	Heating equipment area	1.8	2.0
Electric blanket, heating pad	Bedding	Bedroom	2.0	2.3

Based on 503 civilian deaths in 397 one- and two-fatality fires with known ignition scenarios in the NFPA FIDO data, 1971–78.
All percents in this Table refer to this data set.
Out of 204 distinct scenarios in this data set, the 9 scenarios in this Table accounted for 21.6 percent of the deaths and 21.4 percent of the fires.

One- and Two-Family Dwellings

IGNITION FACTOR: Misuse of material ignited

Material ignited	Heat of ignition	Area of Origin	Percent of Deaths	Percent of Fires
Clothes on a person	Cooking equipment	Kitchen	11.7	13.6
Flammable, combustible liquid used as fuel	Heating, cooking equipment	Living room	9.4	8.5
	Heating, cooking equipment	Kitchen	5.2	6.0
Structural component	Heating, cooking equipment	Living room	4.5	4.0
Upholstered furniture	Heating, cooking equipment	Living room	3.7	3.0
Bedding	Heating, cooking equipment	Bedroom	3.2	3.3
Clothes on a person	Heating, cooking equipment	Bedroom	3.0	3.5

Based on 463 civilian deaths in 387 one- and two-fatality fires with known ignition scenarios in the NFPA FIDO data, 1971-78.
All percents in this Table refer to this data set.
Out of 115 distinct scenarios in this data set, the 7 scenarios in this Table accounted for 38.7 percent of the deaths and 38.9 percent of the fires.

One- and Two-Family Dwellings

IGNITION FACTOR: Misuse of heat of ignition

Heat of ignition	Material ignited	Area of Origin	Percent of Deaths	Percent of Fires
Cigarette	Upholstered furniture	Living room	38.4	34.6
	Bedding	Bedroom	34.0	26.0
	Bedding	Living room	1.9	1.9
	Upholstered furniture	Bedroom	1.7	1.7
	Rubbish	Kitchen	1.0	1.0
Match, lighter, candle	Bedding	Bedroom	3.7	3.5
	Soft goods other than bedding or clothes on a person	Bedroom	1.5	1.3
	Upholstered furniture	Living room	1.4	1.3
	Clothes on a person	Bedroom	1.1	1.3

Based on 1,826 civilian deaths in 1,490 one- and two-fatality fires with known ignition scenarios in the NFPA FIDO data, 1971-78.
All percents in this Table refer to this data set.
Out of 182 distinct scenarios in this data set, the 9 scenarios in this Table accounted for 71.7 percent of the deaths and 71.6 percent of the fires.

PROFILE OF FATAL FIRE VICTIMS

Berl and Halpin researched 463 fire fatalities that occurred from 1972 to 1977 in Maryland.* Their study has contributed substantially to the understanding of the demographic characteristics of fire casualties and the physical and biochemical reasons for these deaths.

The study found that a disproportionate number of fire deaths occurred among the very young and the elderly — nearly 22 percent occurred in those aged 9 years or less and 20 percent in those 60 years or more. Others studies as well show the same trend of a disproportionate number of fire deaths among the very young and the elderly when compared with their proportion in the U.S. population. This phenomenon can be partially explained by the inability of these individuals to successfully escape from the fire scene and their low tolerance to toxic gases and other combustion products.

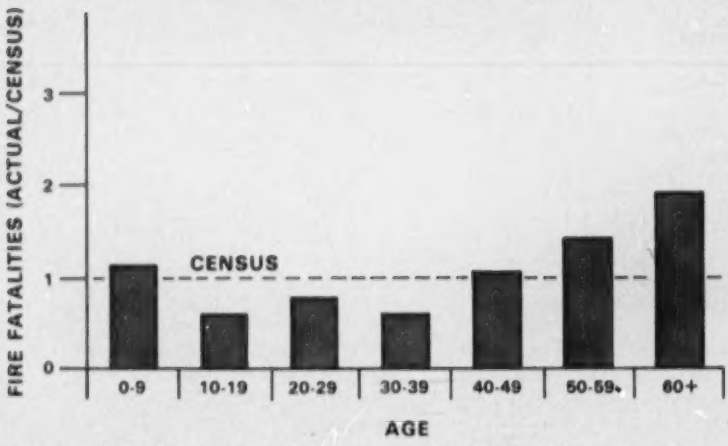
The research indicated that the number of male fire deaths overall was about 1½ times the number of female fire deaths. Data reported from 1978 by the U.S. Fire Administration showed similar results. Nationwide, the fire death rate of males (41.0 deaths per million people) was nearly twice the rate of females (23.0). Berl and Halpin noted that greater alcohol use among men, especially those over 20 years of age, was largely responsible for the higher number of fire deaths among males.

When 454 fire victims were examined for blood alcohol level (BAL), 35 percent had BAL in excess of 0.1 percent (the legal definition of drunkenness in Maryland). Over two-thirds of the heavily intoxicated victims were men. With substantial alcohol ingestion, the ability to act quickly, decisively, and correctly in response to fire is inhibited, increasing the chances of a fatal outcome.

The leading medical cause of civilian fire deaths is the inhalation of toxic gases alone or combined with burns. Berl and Halpin found that nearly 60 percent of the fire victims had carboxyhemoglobin (COHb) levels exceeding 50 percent, a concentration considered as the margin for survival. However, persons with diminished circulatory systems have less resistance to toxic gases and tend to succumb at carbon monoxide levels less than 50 percent.

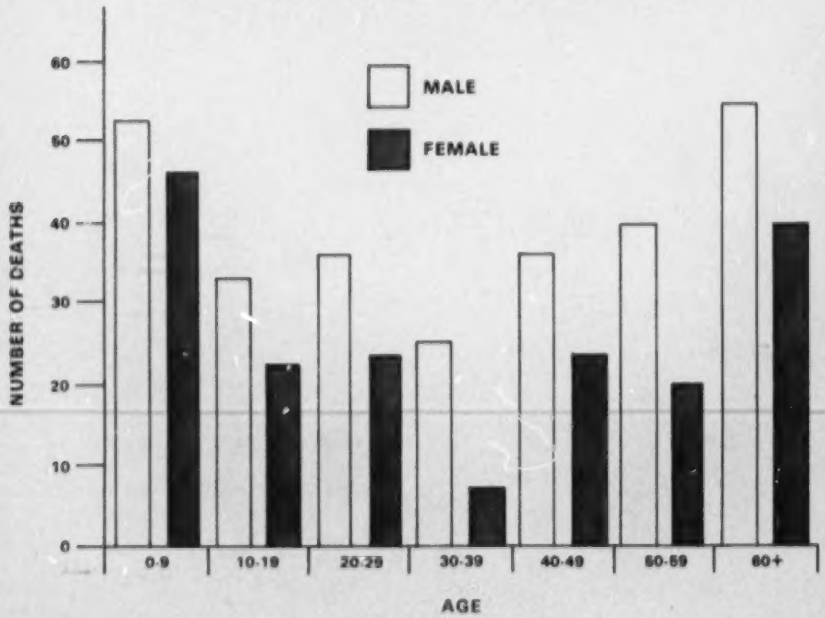
*Berl, Walter C., and Halpin, Byron M., "Human Fatalities from Unwanted Fires," *Fire Journal*, Vol. 73, No. 5 (September 1979), pp. 105–115.

Fire Fatality Rates by Age Group (Maryland)



Ratios of observed fire fatalities compared to random occurrence based on 1970 population census data for Maryland. A ratio greater than one indicates a greater than random chance of a fire casualty in a particular age group. (Based on a study of 463 fire deaths that occurred from 1972-1977 in the state of Maryland.) (Source: Berl and Halpin)

Fire Fatalities by Age and Sex in Maryland (1972-77)



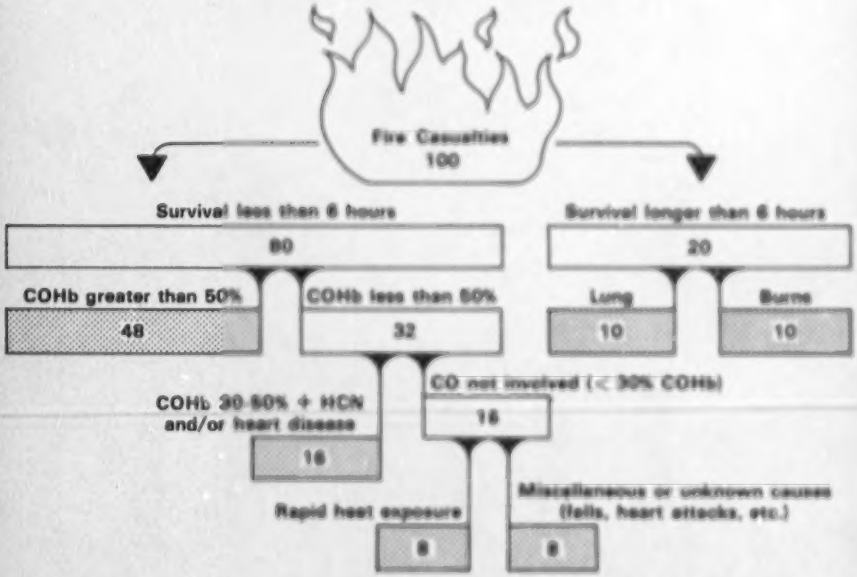
Distribution of fire fatalities by age and sex in the state of Maryland, based on a study of 463 fire deaths that occurred in that state from 1972-1977. (Source: Berl and Halpin)

Distribution of Fire Fatalities by Age and Blood Alcohol Level (BAL) in Maryland

AGE		0		.01-.09		≥.10	
	No.	Percent	No.	Percent	No.	Percent
0-9	98	100	0	0	0	0
10-19	44	77.2	7	12.3	6	10.5
20-29	39	62.9	5	8.0	18	29.3
30-39	8	23.5	3	8.8	23	67.6
40-49	14	25.0	5	8.9	37	66.0
50-59	15	25.9	3	5.1	40	68.9
60+	47	52.8	7	7.9	35	39.2
TOTALS	265	—	30	—	159	—

Based on a study of 454 fire deaths that occurred from 1972-1977 in the state of Maryland. Source: Berl and Halpin.

Fire Fatalities by Medical Cause (Maryland)



Overall assessment of fire fatalities showing the medical causes leading to death. Numbers inside the shaded boxes indicate percentages of major events resulting in fatal outcomes. (Source: Berl and Halpin)

PROPERTY LOSS FROM FIRE

Direct property damage from fire increased over the 1977–1980 period. In 1977, total fires resulted in an estimated property damage of $4,709,000,000 compared to $6,254,000,000 in 1980, for an increase of 33% over the four year period. For structure fires, an estimated $4,125,000,000 in property damage occurred in 1977 compared to an estimated $5,454,000,000 in property damage in 1980, an increase of 32% over the four year period. It should be noted that most of the increase in property damage over the four year period appears to be due to the effects of inflation; when property loss in structure fires is adjusted for inflation, there is hardly any change in structure property damage over the four year period.

Structure fires accounted for an average 88% of all fire property loss annually during the 1977–80 period. Fires in one- and two-family dwellings accounted for an annual average of 43% of all structure fire loss during the four year period — by far the leading property use contributing to loss. Other property use categories contributing heavily to total structure property loss were industry, utility, and defense (an average of 15% for the four years), stores and offices (11%), and storage (10%). Fires in vehicles accounted for an annual average of 10% of all property loss.

Property loss as a result of incendiary or suspicious fires accounted for an average 28% of all structure property loss annually during the 1977–1980 period.

The table on the next page displays estimates of direct property loss by major property type in the U.S. by year (1977–1980). Dollar loss figures represent direct property loss only and do not include indirect losses, *e.g.*, business interruption or temporary shelter costs.

Estimates of Direct Property Loss by Major Property Use in the United States by Year (1977–1980)

	1977	1978
Residential (Total)	$2,179,000,000	$2,192,000,000
One- and Two-Family Dwellings*	1,712,000,000	1,784,000,000
Apartments	325,000,000	310,000,000
Hotels and Motels	118,000,000	82,000,000
Other Residential	24,000,000	16,000,000
Public Assembly	286,000,000	194,000,000
Schools and Colleges	139,000,000	111,000,000
Institutions	15,000,000	14,000,000
Stores and Offices	452,000,000	475,000,000
Industry, Utility, Defense**	526,000,000	594,000,000
Storage in Structures**	451,000,000	342,000,000
Special Structures	77,000,000	100,000,000
TOTAL STRUCTURE LOSS	$4,125,000,000	$4,022,000,000
Outside Fires (with value)	144,000,000	32,000,000
Vehicles***	332,000,000	391,000,000
All Other	106,000,000	53,000,000
TOTAL PROPERTY LOSS	$4,709,000,000	$4,498,000,000

	1979	1980
Residential (Total)	$2,529,000,000	$3,042,000,000
One- and Two-Family Dwellings*	2,034,000,000	2,447,000,000
Apartments	343,000,000	401,000,000
Hotels and Motels	100,000,000	154,000,000
Other Residential	52,000,000	40,000,000
Public Assembly	264,000,000	326,000,000
Schools and Colleges	79,000,000	101,000,000
Institutions	34,000,000	25,000,000
Stores and Offices	457,000,000	645,000,000
Industry, Utility, Defense**	966,000,000	672,000,000
Storage in Structures**	507,000,000	512,000,000
Special Structures	108,000,000	131,000,000
TOTAL STRUCTURE LOSS	$4,964,000,000	$5,454,000,000
Outside Fires (with value)	38,000,000	61,000,000
Vehicles***	682,000,000	685,000,000
All Other	66,000,000	54,000,000
TOTAL PROPERTY LOSS	$5,750,000,000	$6,254,000,000

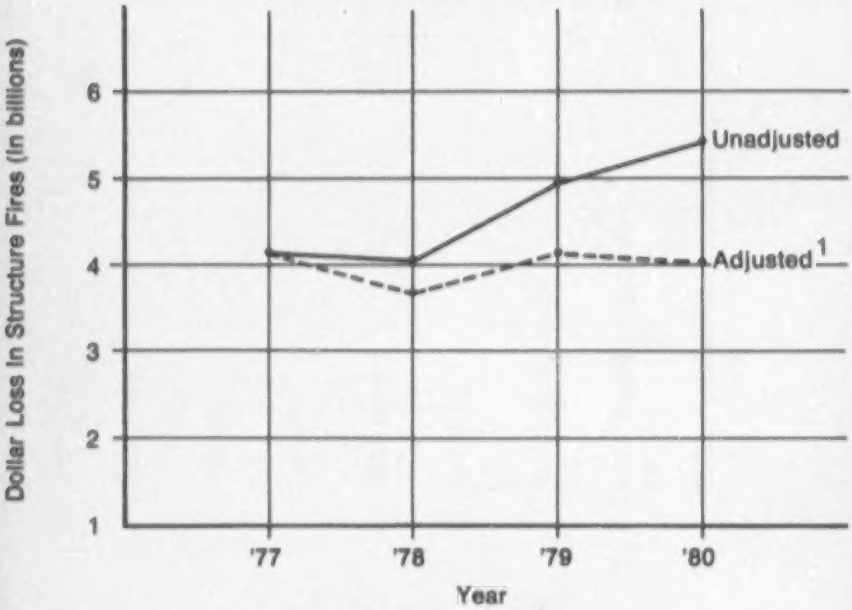
* Includes mobile homes.

** Since some incidents for these property uses were handled only by private fire brigades or fixed suppression systems and were not reported to the NFPA, the results represent only a portion of U.S. fire experience.

*** This category includes highway vehicles, trains, boats, ships, aircraft, farm vehicles, and construction vehicles.

The estimates are based on data reported to the NFPA by fire departments that responded to the 1977, 1978, 1979, and 1980 NFPA National Fire Experience Surveys; minor adjustments were made based on data reported to the NFPA in the FIDO (Fire Incident Data Organization) System. Dollar loss figures represent direct property loss only. Dollar loss estimates are based on figures reported by departments for a year, and no adjustments were made for inflation over the four year period.

Property Loss in Structure Fires for Unadjusted and Adjusted Estimates U.S. 1977-1980



[1]Adjusted for inflation based on Consumer Price Index; 1977 used as base year.
Source: NFPA Survey of Fire Departments for U.S. Fire Experience (1977-1980).

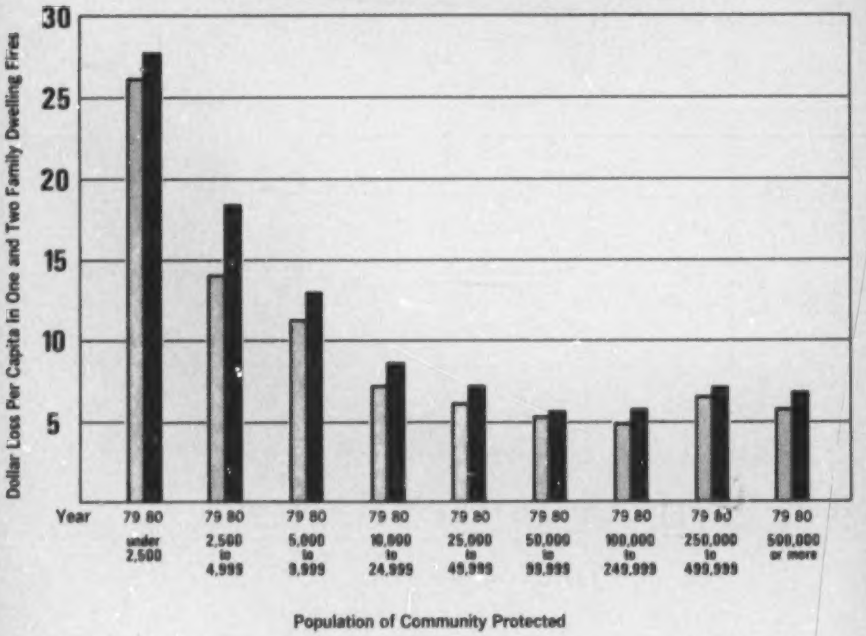
DOLLAR LOSS RATES IN ONE- AND TWO-FAMILY DWELLING FIRES BY COMMUNITY SIZE AND YEAR (1979, 1980)

The figure on page 38 displays dollar loss per capita in one- and two-family dwelling fires by community size and year (1979, 1980).

By community size, the smallest communities had the higher dollar loss rates for both years; however, the rates for smaller communities are subject to considerable variability.

By year, a slight increase in dollar loss rates was experienced in 1980 for all community sizes; some of this increase was due to the effects of inflation.

Dollar Loss Rates in One- and Two-Family Dwelling Fires by Community Size and Year (1979, 1980)



Source: NFPA's Survey of Fire Departments for U.S. Fire Experience (1979, 1980)

Average Direct Property Loss By Population of Community (1980)

Population of Community*	All Fires	Residential Fires
500,000 to 999,999	$16,943,100	$7,833,140
250,000 to 499,999	9,431,280	3,715,800
100,000 to 249,999	2,517,800	1,301,990
50,000 to 99,999	1,074,860	504,240
25,000 to 49,999	727,160	276,200
10,000 to 24,999	385,550	167,580
5,000 to 9,999	172,010	99,180
2,500 to 4,999	169,200	66,970
under 2,500	61,210	35,130

Figures include only direct property damage to the physical structure and contents. Figures do not include indirect losses such as business interruption or temporary shelter provisions.
Source: NFPA's Survey of Fire Departments for U.S. Fire Experience (1980).
*There was insufficient data for communities reporting in the one million or more category.

INTERNATIONAL FIRES AND PROPERTY LOSS

In 1980, NFPA obtained current statistics on international fire losses through a special survey of 26 countries that were mostly members of the conference of Fire Protection Associations.

The table below displays fire incident rates and dollar loss rates by nation. When fire occurrence rates are examined, the U. S. leads all countries with 12.89 fires per 1,000 persons and 4.86 structure fires per 1,000 persons. However, when dollar loss per capita rates are examined the U. S. is among the lowest; and when dollar loss per fire is examined, the U. S. is the lowest with a rate of $1.60 per fire.

Comparison of international fire losses is helpful in analyzing the worldwide fire problem. In considering the data shown here, however, it should be noted that the lack of standard definitions, methods of reporting, and methods of estimating fire losses creates difficulty in making direct comparisons and interpreting their significance. In addition, other variables such as cultural and socio-economic conditions, climate, and building construction make comparisons between countries difficult. These limitations must be kept in mind when examining these statistics.

Direct Property Losses for Selected Countries

	Reported Number of Fires per 1,000 Persons	Reported Number of Structure Fires per 1,000 Persons	Dollar Loss[1] Per Capita (U.S. Dollars)	Dollar Loss Per Fire (U.S. Dollars in Thousands)
EUROPE				
Belgium	1.73	1.31	N/A	N/A
Denmark	3.72	2.88	$35.04	$ 9.41
Finland	3.25	1.68	10.70	3.30
France[2]	1.68	N/A	20.80	12.40
Germany[3]	1.86	N/A	26.73	14.40
Netherlands	1.90	0.80	21.44	11.26
Norway	4.09	N/A	43.37	10.60
Sweden	N/A	N/A	23.86	N/A
Switzerland	6.53	N/A	29.32	4.49
United Kingdom[2]	5.85	2.78	10.01	1.71
NORTH AMERICA				
Canada	3.19	N/A	23.32	7.31
United States	12.89	4.86	20.58	1.60
ASIA				
Hong Kong	2.31	1.11	4.81	2.09
Japan[2]	0.56	0.34	4.74	8.43
Korea	0.15	N/A	0.47	3.10
Singapore	1.78	0.44	5.36	3.02
THE PACIFIC				
Australia[2]	5.40	N/A	23.30	4.31
New Zealand	7.64	2.60	23.14	3.03
AFRICA				
South Africa	0.62	0.14	2.26	3.68

Based on data from 1978 except where noted. Information was obtained from a 1980 survey conducted by the NFPA except for Japan (source: *White Book on the Fire Service in Japan*, Fire Defense Agency, November 1978); Canada (source: *1978 Fire Losses in Canada*, Report of the Dominion Fire Commissioner, Ottawa, 1980); Australia (source: *Fire Protection*, Fire Protection Association of South Africa, March 1980); and Singapore (source: *Singapore Fire Brigade Annual Report*, 1978).

[1] Foreign exchange rates (mid-year market quotations to the extent available) were taken from the *Statistical Abstract of the United States* (100th ed.), U.S. Department of Commerce, Bureau of the Census, Washington, D.C., 1979.

[2] Based on data from 1977; later data were not available.

[3] German Federal Republic.

INCENDIARY AND SUSPICIOUS FIRES AND PROPERTY LOSS

The table below presents the number of fires and property loss that occur as the result of incendiary and suspicious fires in structures by year (1977–1980).

There has been a steady decline in the total number of incendiary and suspicious fires in structures over the 1977–1980 period from 167,500 in 1977 to 146,000 in 1980, for a decrease of 12.8% over the four year period. However, the total number of suspicious fires has been declining, while the total number of incendiary fires has been increasing slightly.

Property loss as a result of incendiary and suspicious fires in structures has increased dramatically over the 1977–1980 period from $1,020,000,000 in 1977 to $1,760,000,000 in 1980, for a substantial increase of 72.5%. Even when property loss due to incendiary fires is adjusted for inflation, the trend in higher property loss persists over the four year period. Not only are properties severely damaged by these incendiary and suspicious fires, many occupants are killed in such fires, as discussed previously.

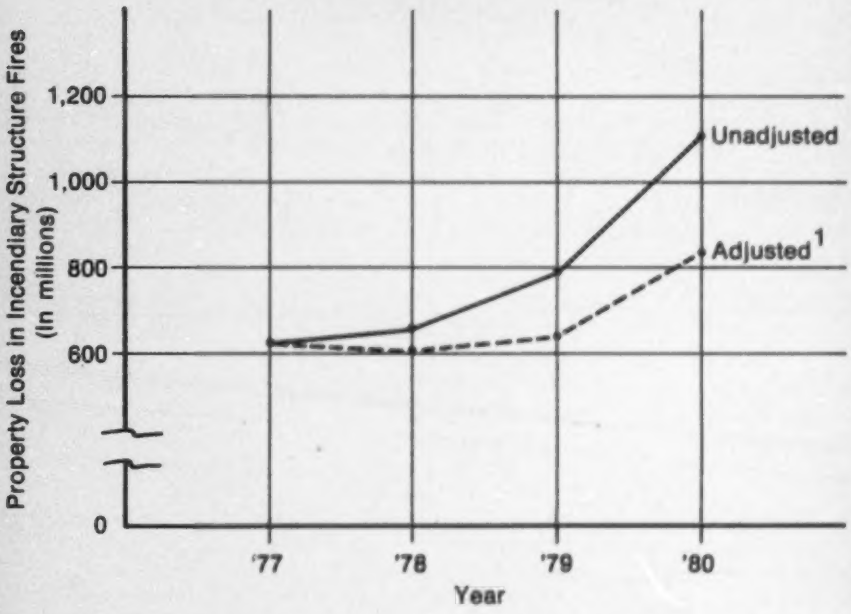
Estimates of 1977–1980 United States Fires and Property Loss for Incendiary and Suspicious Fires in Structures

Type of Fire	Number of Fires 1977	1978	1979	1980
Structure Fire of Incendiary Origin	86,500	87,000	88,500	92,000
Structure Fires of Suspicious Origin	81,000	73,000	60,000	54,000
Total Structure Fires of Incendiary and Suspicious Origin	167,500	160,000	148,500	146,000

Type of Fire	Property Loss 1977	1978	1979	1980
Structure Fire of Incendiary Origin	$636,000,000	$650,000,000	$787,000,000	$1,158,000,000
Structure Fires of Suspicious Origin	$384,000,000	$417,000,000	$541,000,000	$602,000,000
Total Structure Fires of Incendiary and Suspicious Origin	$1,020,000,000	$1,067,000,000	$1,328,000,000	$1,760,000,000

The estimates are based on data reported to the NFPA by fire departments that responded to the 1977, 1978, 1979, and 1980 NFPA National Fire Experience Surveys. Dollar loss figures represent direct property loss only. Dollar loss estimates are based on figures reported by departments for a year, and no adjustments were made for inflation over the four year period.

Property Loss in Incendiary Structure Fires for Unadjusted and Adjusted Estimates, U.S. 1977-1980.



[1] Adjusted for inflation based on Consumer Price Index; 1977 used as base year.
Source: NFPA Survey of Fire Departments for U.S. Fire Experience (1977-1980).

LARGE-LOSS FIRES

NFPA annually conducts a study of fires resulting in a large dollar loss. For many years a large-loss fire was defined as a fire resulting in a direct property loss of $250,000 or more. In 1978 and again in 1980, NFPA redefined a large-loss fire as a fire resulting in a direct dollar loss of $500,000 and $1,000,000, respectively. Although they are few in number, large-loss fires account for a substantial portion of the overall national fire loss. For example, the large-loss fires reported for 1980 accounted for 15.2% of the overall dollar loss, but only 0.01% of the total fires.

THE INFLATION FACTOR

Continuing monetary inflation has led the NFPA to redefine a large-loss fire as one that caused $1 million or more of direct fire damage in terms of 1980 dollars. Figure 1 on the facing page illustrates the inflation of a $500,000 fire loss in 1971 dollars to a $1,178,900 loss in 1980 dollars, as measured by the Producer Price Index of the Bureau of Labor Statistics.[1]

Inflation also increases the number of fires that qualify as large-loss fires. Figure 2 illustrates the number of verified fires of $1 million damage or more reported to the NFPA for each of the years 1971 through 1980.

Regardless of which index is used for adjustments, the number of fires resulting in a loss of $1 million or more that were reported to the NFPA was relatively constant, except for an increase in 1979 and 1980. This increase may have been the result of a more intense effort to collect fire data for these years. Since most of the large-loss fires and the resulting dollar losses occur in commercial properties, the Producer Price Index was selected to adjust dollar losses for inflation. This is appropriate because the Producer Price Index is based on the selling price of commodities of producers and manufacturers, as opposed to the Consumer Price Index, which is weighted towards the costs of goods and services purchased by the urban wage earner.

[1] Producer Price Index, 1965 to 1980, as reported in *The Statistical Abstract of the United States*, 1980, page 481, Table 800.

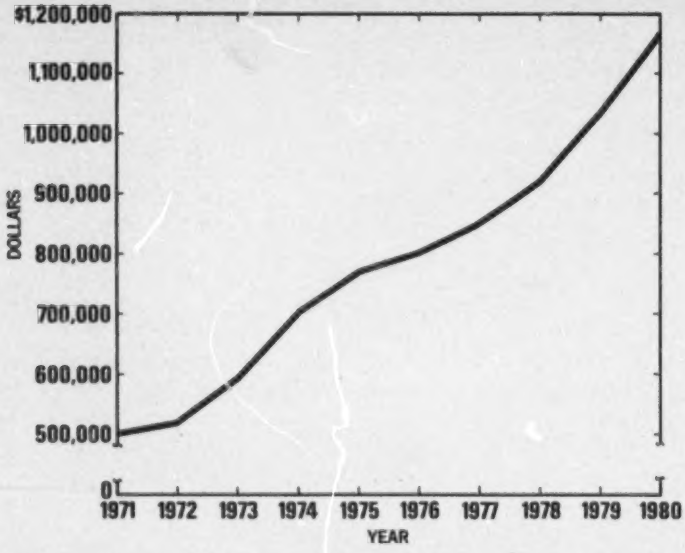


Figure 1. $500,000 fire loss in 1971, adjusted for inflation, as measured by the Producer Price Indexes, 1971 to 1980.

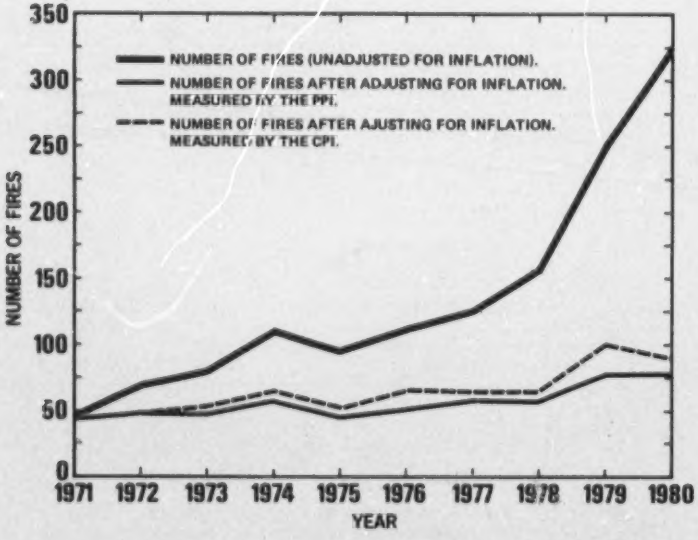


Figure 2. Increase in number of larger-loss fires as a result of monetary inflation.

LARGE-LOSS FIRES (1976–1980)

The next two tables display large-loss fires, unadjusted and adjusted for monetary inflation, 1976–1980. A large-loss fire is defined as a verified direct property loss of $1 million or more.

The unadjusted table reflects NFPA's prior methodology in the preparation of large loss reports. The effects of monetary inflation affect the unadjusted results by increasing the total dollar loss for all large-loss fires, and by qualifying as large-loss fires those fires that would otherwise fall below the $1 million threshold.

The adjusted table includes adjustments made for monetary inflation as measured by the Producer Price Index, 1976 to 1980. The adjusted tables allow for more objective comparisons from year to year. The number of large-loss fires over the five year period remained relatively constant, except for an increase in 1979 and 1980. This increase may be the result of an intense effort to collect fire data for these years.

Large-Loss Fires Unadjusted for Monetary Inflation, 1976–1980

Year	*No. of Fires*	*Loss*	*Average Loss/Fire*
1980	323	$948,804,100	$2,937,474
1979	249	673,792,600	2,705,994
1978	162	469,025,400	2,895,217
1977	130	410,593,200	3,158,407
1976	115	360,854,000	3,137,861

The statistics in this Table differ from previously published results since only verified losses of $1 million or more are included and since losses have been updated with new information.

Monetary inflation influences the average loss per fire both by increasing the total dollar loss for all large-loss fires and by qualifying as large losses those fires that would otherwise fall below the $1 million threshold.

Large-Loss Fires Adjusted for Monetary Inflation, 1976–1980

Year	*No. of Fires*	*Loss*	*Average Loss/Fire*
1980	169	$531,203,582	$3,143,214
1979	155	445,090,559	2,871,550
1978	98	353,525,939	3,607,405
1977	95	354,153,480	3,727,931
1976	115	360,854,000	3,137,861

Losses are adjusted for monetary inflation as measured by the Producer Price Index 1976 to 1980, and using 1976 as the base year. The adjustment decreases both the number of fires that resulted in a loss of $1 million or more and the total dollar loss for all large-loss fires.

Large-Loss Fires by Size of Loss/Unadjusted for Monetary Inflation, 1976–1980

	$1 Million and Over But Less Than $3 Million		$3 Million and Over But Less Than $10 Million		$10 Million and Over	
Year	Fires	Loss	Fires	Loss	Fires	Loss
1980	257	$362,737,100	51	$224,060,600	15	$362,006,400
1979	197	289,411,500	43	191,956,100	9	192,425,000
1978	136	193,942,200	17	75,549,900	9	199,533,300
1977	104	149,520,000	18	82,590,000	8	178,483,200
1976	95	144,781,500	13	70,239,600	7	145,832,900

The statistics in this Table differ from previously published results since only verified losses of $1 million or more are included and since losses have been updated with new information.

Large-Loss Fires by Size of Loss/Adjusted for Monetary Inflation, 1976–1980

	$1 Million and Over But Less Than $3 Million		$3 Million and Over But Less Than $10 Million		$10 Million and Over	
Year	Fires	Loss	Fires	Loss	Fires	Loss
1980	133	$200,603,301	27	$128,980,761	9	$201,709,539
1979	119	185,771,845	32	150,817,568	4	108,501,145
1978	78	129,300,064	13	67,026,939	7	157,198,936
1977	72	116,524,072	15	69,206,434	8	168,362,974
1976	95	144,781,500	13	70,239,600	7	145,832,900

Adjusted for monetary inflation as measured by the Producer Price Index, 1976 to 1980 and using 1976 as the base year.

The statistics in this Table differ from previously published results since only verified losses of $1 million or more are included and since losses have been updated with new information.

MAJOR LARGE-LOSS FIRES

The following tables list the major individual large-loss fires that occurred from 1976 to 1980.

These listings were based on dollar loss information at the time the annual large-loss reports were published. Although every effort was made by NFPA to collect data on all United States large-loss fires, dollar loss estimates in some instances could not be verified and it is also likely that some incidents did not come to NFPA's attention.

Losses of $5 Million or More in the United States, 1980

Place	Date	Property Use	Estimated Loss
†*Las Vegas, Nev.	Nov. 21	Hotel	$ 50,000,000
Borger, Tex.	Jan. 20	Refinery	50,000,000
New Castle, Del.	Oct. 21	Chemical Manufacturer	45,000,000
San Bernadino, Calif.	Nov. 24	Brush & Dwelling	38,031,400
New Orleans, La.	July 8	Plumbing Supply Manufacturer	35,250,000
Huntsville, Ala.	Feb. 19	Multi-Use Industrial Park	26,000,000
Salem, N.H.	July 29	Racetrack Clubhouse	20,000,000
Pekin, Ill.	Oct. 14	Electric Power Plant	17,000,000
*New York, N.Y.	June 23	Office Building	15,000,000
Newark, Del.	June 10	Automobile Assembly Plant	13,000,000
Perth Amboy, N.J.	July 7	Multi-Use Industrial Park	12,000,000
Los Angeles, Calif.	May 13	Aircraft Parts Warehouse	10,572,500
Covington, Va.	June 13	Synthetic Fiber Manufacturer	10,152,500

*Investigated by NFPA Staff.

†Estimates of property damage range from over $30 million to $50 million.

Losses of $5 Million or More in the United States, 1980 (Continued)

Place	*Date*	*Property Use*	*Estimated Loss*
Spearfish, S.D.	Feb. 19	Lumber Mill	10,000,000
Totowa, N.J.	Feb. 13	Paper Products Warehouse	10,000,000
Bellingham, Wash.	April 8	Boat Manufacturer	8,900,000
New York, N.Y.	Nov. 10	College (new construction)	7,502,500
Rutland, Vt.	Feb. 5	Bulk Mail Warehouse	7,400,000
Livingston, Ala.	June 14	Lumber Mill	7,000,000
Sterling, Conn.	March 1	Textile Warehouse	7,000,000
Tacoma, Wash.	April 15	Rolled Paper Warehouse	6,470,000
New York, N.Y.	Feb. 1	Hotel (renovation)	6,000,000
Minnetonka, Minn.	May 9	Catalog Retail Sales	6,000,000
Pennington, N.J.	Jan. 16	Private School	6,000,000
Corvallis, Ore.	July 19	Lumber Mill	5,793,900
Niagara Falls, N.Y.	April 25	Metal Products Manufacturer	5,615,000
Seminole, Fla.	May 2	Boat Storage	5,500,000
Groton, Conn.	July 13	Navy Commissary	5,230,000
Cicero, Ind.	Sept. 30	Church	5,080,000
Elwood, Ill.	March 18	Gas Manufacturer	5,005,000
Chicago, Ill.	Aug. 26	Chemical Warehouse	5,000,000
Tustin, Calif.	May 11	Apartment Complex	5,000,000
Irving, Tex.	May 14	Roofing Material Manufacturer	5,000,000
San Diego, Calif.	March 29	Condominiums (new construction)	5,000,000
TOTAL: 34 Fires			$476,502,800

Losses of $3 Million or More in the United States, 1979

Place	*Date*	*Property Use*	*Property Loss*
Deer Park, Tex.	Sept. 1	Tank Ship (unloading crude oil)	$ 70,000,000
Port Neches, Tex.	April 19	Tank Ship (unloading crude oil)	32,000,000
Edison, N.J.	Jan. 17	General Warehouse	30,000,000
Gulf of Mexico, La.	April 20	Gas-Drilling Platform	25,000,000
*Houston, Tex.	July 31	Apartment Complex	20,000,000
Linden, N.J.	March 20	Refinery	14,300,000
San Antonio, Tex.	Jan. 6	Auditorium	12,000,000
La Place, La.	Aug. 30	Tank Barge	10,500,000
London, Ky.	Jan. 16	Mercantile Block	10,000,000
*New York, N.Y.	June 14	Department Store	10,000,000
Maryville, Mo.	July 24	School Administration Building	10,000,000
Los Angeles, Calif.	Sept. 13	Brush	9,840,600
Richmond, Va.	July 10	Tobacco Warehouse	8,000,000
Hawesville, Ky.	Feb. 23	Metal Manufacturing Plant	6,800,000
Trenton, N.J.	March 1	Plastic-Products Warehouse	6,500,000
Hicksville, N.Y.	Aug. 9	Electronics Manufacturing Plant	6,500,000
Nantucket, Mass.	Dec. 18	Business Block	6,500,000
Woburn, Mass.	March 14	Metal-Products Warehouse	6,427,500
Concord, N.C.	Jan. 31	Textile Plant	6,300,000
Thousand Palms, Calif.	July 24	Trains (collision)	6,100,000
Los Angeles, Calif.	Sept. 12	Brush	6,048,900
Chicago, Ill.	Aug. 3	Transit Company Garage	6,000,000
West Monroe, La.	Nov. 16	Agricultural Storage	6,000,000
Vancouver, Wash.	June 18	General Warehouse	5,063,800

* Investigated by NFPA staff.

Losses of $3 Million or More in the United States, 1979 (Continued)

Place	*Date*	*Property Use*	*Property Loss*
Atlanta, Ga.	March 14	Hotel	5,035,000
Santa Paula, Calif.	May 10	Fruit Packing Plant	5,000,000
Crossett, Ark.	July 5	Paper Manufacturing Plant	5,000,000
Miami, Fla.	Aug. 11	Cruise Ship	5,000,000
Minneapolis, Minn.	Jan. 14	Medical Offices	4,750,000
Lake Superior, Minn.	June 5	Bulk Cargo Ship	4,500,000
Texas City, Tex.	Aug. 7	Refinery	4,300,000
Calvert City, Ky.	May 31	Metal Manufacturing Plant	4,097,000
Spokane, Wash.	Feb. 11	Office Building	4,074,800
Torrington, Conn.	Jan. 18	Church	4,000,000
Poplar Bluff, Mo.	Feb. 24	Shopping Mall	4,000,000
Pekin, Ill.	March 20	Distillery	4,000,000
Solana Beach, Calif.	June 9	Apartment Complex	4,000,000
Dallas, Tex.	Sept. 16	Apartment Complex	4,000,000
Toledo, Ohio	Dec. 29	Cargo Ship (ore carrier)	4,000,000
Los Angeles, Calif.	Sept. 16	Brush/Dwellings	3,900,000
Harrisson, Ark.	Jan. 17	Telephone Exchange	3,500,000
Leeds, Ala.	June 11	Metal Manufacturing Plant	3,500,000
Lafayette, Ind.	Feb. 2	Mercantile Block	3,400,000
Portland, Ore.	May 29	High School	3,300,000
Everett, Wash.	July 10	Paper-Products Warehouse	3,290,000
Miami, Fla.	Oct. 26	Passenger Aircraft (on concourse)	3,200,000
Shelby, N.C.	May 25	Mercantile Block	3,100,000
Woodland Hills, Calif.	June 15	Supermarket	3,100,000
San Francisco, Calif.	Jan. 4	Sporting/Surplus Goods Store	3,000,000
Harrison, N.Y.	Jan. 7	Aircraft Hangar	3,000,000
Chicago, Ill.	Feb. 14	Picture-Frame Warehouse	3,000,000
Brentwood, Md.	March 3	Building Supply Outlet	3,000,000
Near Morgan City, La.	March 5	Oil-Drilling Platform	3,000,000
Arlington, Tex.	July 29	General Warehouse	3,000,000
Dillon, Mont.	Sept. 3	Grain Elevator	3,000,000
Cove Point, Md.	Oct. 6	LNG Terminal	3,000,000
Green River, Wyo.	Nov. 11	Railway Derailment	3,000,000
Torrance, Calif.	Dec. 3	Refinery	3,000,000
Lincoln, Ill.	Dec. 8	Paper-Products Warehouse	3,000,000
Bethel, Alaska	Dec. 16	Large Discount Store	3,000,000
Rockford, Ill.	Dec. 19	Church	3,000,000
		TOTAL: 61 Fires	$464,996,700

Losses of $3 Million or More in the United States, 1978

Place	*Date*	*Property Use*	*Property Loss*
Los Angeles, Calif.	Oct. 23	Brush	$38,166,000
*Los Angeles, Calif.	March 1	Aircraft on Runway	30,000,000
*Bensenville, Ill.	Sept. 21	General Warehouse	25,000,000
*Des Moines, Iowa	Nov. 5	Department Store	25,000,000
Commerce City, Colo.	Oct. 3	Refinery	20,000,000
Cazadero, Calif.	Aug. 9	Forest	13,000,000
West Palm Beach, Fla.	Dec. 26	Jai Alai Fronton	12,000,000
Grand Blanc, Mich.	Jan. 31	Auto Parts Warehouse	10,000,000
Rockymount, Va.	Nov. 14	Manufacturing Plant	10,000,000
Stickney, Ill.	Nov. 19	Grandstand	10,000,000
Little Rock, Ark.	June 13	Furniture Manufacturing Plant	9,000,000
Springfield, Ky.	Dec. 25	Tobacco Products Warehouse	9,000,000
San Diego, Calif.	Feb. 22	Aerospace Museum	7,000,000
Croskston, Minn.	May 1	Potato Processing Plant	6,200,000
Los Angeles, Calif.	Oct. 23	Brush	5,198,000
Atlantic City, N.J.	Oct. 23	Businesses on Boardwalk	5,000,000
Houston, Tex.	May 13	Apartment Complex	4,623,900
Tampa, Fla.	Jan. 19	Instrument Manufacturing Plant	4,500,000
Fairfax County, Va.	Dec. 30	High School	4,500,000
Lodi, Calif.	Sept. 24	Food Processing Plant	4,000,000
Anaconda, Minn.	Nov. 18	Ore Conveyor	4,000,000
Bakersfield, Calif.	Nov. 1	Lumberyard	4,000,000
Houston, Tex.	Feb. 4	General Warehouse	3,528,000
Lakeland, Fla.	Aug. 9	Drug Store	3,500,000
Houston, Tex.	Nov. 3	Plastic Manufacturing Plant	3,400,000
Hammond, Ind.	Oct. 1	Chemical Manufacturing Plant	3,300,000
Muncie, Ind.	Jan. 27	Church	3,240,000
Santa Barbara, Calif.	Aug. 20	Agricultural Products Warehouse	3,100,000
Scranton, Pa.	Feb. 13	Elementary School	3,000,000
Lawrenceville, Ga.	April 7	Plastic Products Manufacturing Plant	3,000,000
Coventry, R.I.	April 10	Glass Product Manufacturing	3,000,000
Calumet City, Ill.	April 13	Plastic Manufacturing	3,000,000
Potomac, Ill.	July 22	Prison	3,000,000
Canokia, Ill.	Aug. 13	Aircraft Hangar	3,000,000
		TOTAL: 34 Fires	$296,255,900

* Investigated by NFPA staff.

Losses of $3 Million or More in the United States, 1977

Place	*Date*	*Property Use*	*Estimated Loss*
Fairbanks, Alaska	July 8	Pumping Station	$40,000,000
*Santa Barbara, Calif.	July 26	Brush & Homes	35,000,000
*Westwego, La.	Dec. 22	Grain Elevator	30,000,000
Los Alamos, N.M.	June 19	Brush	24,800,000
*Galveston, Tex.	Dec. 27	Grain Elevator	24,000,000
Farmington, N.M.	July 7	Electric Generating Plant	24,000,000
Holmes, Pa.	July 3	Iron and Steel Manufacturing Plant	20,000,000
Los Padres National Forest, Calif.	August 1	Brush	17,428,000
Dallas, Tex.	Oct. 26	Electric Generating Plant	15,000,000

* Investigated by NFPA staff.

Losses of $3 Million or More in the United States, 1977 (Continued)

Place	*Date*	*Property Use*	*Estimated Loss*
Homewood, Ill.	Feb. 3	Grandstand	15,000,000
*Cherry Hill, N.J.	April 14	Grandstand	12,055,000
Cleveland National Forest, Calif.	July 28	Brush	8,400,000
Worcester, Mass.	Oct. 10	General Storage Warehouse	8,000,000
Bridgeman, Mich.	July 23	Plastic Product Storage	7,005,000
Flagstaff, Ariz.	June 17	Forest-Communications Center	6,579,000
Eau Claire, Wis.	Nov. 27	Commercial and Residential	6,500,000
San Jose, Calif.	Nov. 27	Office Building	6,113,000
New Orleans, La.	May 31	General Storage Warehouse	5,227,500
Philmont, N.Y.	Jan. 11	Plastics-Rubber Manufacturing Plant	5,000,000
Salisbury, Md.	June 27	Civic Center	5,000,000
Bethlehem, Pa.	Feb. 12	Shopping Center	5,000,000
Warson Woods, Mo.	May 10	Shopping Center	4,500,000
Holdenville, Okla.	August 28	Plastics Manufacturing Plant	4,000,000
North East, Pa.	May 15	Seminary	4,000,000
Kansas City, Mo.	Dec. 23	General Storage Warehouse	4,000,000
Palmyra, Mo.	Oct. 18	Pesticide Manufacturing Plant	4,000,000
Coulee City, Wash.	Nov. 19	Electric Generating Plant	4,000,000
Williamsport, Pa.	Feb. 13	Church	3,740,000
Lackawanna, N.Y.	Oct. 13	Steel Manufacturing Plant (Ore Conveyor)	3,500,000
Passaic, N.J.	May 19	Manufacturing Plant	3,500,000
Hilo, Hawaii	April 6	High School	3,000,000
Oak Hill, W.Va.	Dec. 30	Radio-Television Station	3,000,000
Akron, Ohio	June 23	Sewer System	3,000,000
Springfield Twp., Pa.	March 14	High School	3,000,000
		TOTAL: 34 Fires	$367,347,500

Losses of $3 Million or More in the United States, 1976

Place	*Date*	*Property Use*	*Estimated Loss*
Galena Park, Tex.	Feb. 22	Grain Elevator	$ 42,000,000
Marion, N.C.	Jan. 14	Furniture Manufacturer	16,200,000
*Los Angeles, Calif.	Dec. 17	Oil Tanker	10,000,000
Tinnicum Township, Pa.	Apr. 16	Multitenant Industrial Complex	10,000,000
Bethune, S.C.	Apr. 19	Food Processor	9,000,000
Anderson, Calif.	Mar. 23	Plywood Manufacturer	9,000,000
Denver, Colo.	Mar. 19	Laboratory	8,400,000
Austin, Tex.	Feb. 3	School	8,000,000
*Waltham, Mass.	Apr. 10	Computer Facility	7,000,000
Sacramento, Calif.	Jun. 29	Wood Chip Pile	7,000,000
McKeesport, Pa.	May 21	Block of Stores	5,500,000
Caldwell, Idaho	May 11	Potato-Processing Plant	5,000,000
King Cove, Alaska	Nov. 28	Food Processor	4,500,000
Oakland, Calif.	Sept. 10	Electronic Equipment Storage	4,500,000
Belt, Mont.	Nov. 26	Train	4,000,000
Long Lake, Minn.	Dec. 20	Church	4,000,000
Salamanca, N.Y.	Jan. 23	Furniture Manufacturer	4,000,000
Jamaica Plain, Mass.	Feb. 1	Multitenant Manufacturing Complex	3,500,000

* Denotes fire investigated by NFPA.

Losses of $3 Million or More in the United States, 1978 (Continued)

Place	*Date*	*Property Use*	*Estimated Loss*
Chignik, Alaska	Jul. 5	Food Processor	3,500,000
Wenatchee, Wash.	Feb. 8	Apple-Processing Plant	3,500,000
Opa-Locka, Fla.	Feb. 6	Clothes Warehouse	3,000,000
Lancaster, Pa.	Mar. 29	Motel	3,000,000
Hawk Inlet, Alaska	May 18	Food Processor	3,000,000
Salem, Mass.	Aug. 24	Tannery	3,000,000
		TOTAL: 24 Fires	$180,600,000

WHERE LARGE-LOSS FIRES OCCUR

The two tables below present large-loss fires by specific property use for 1978, 1979, and 1980. Over the three year period, three major property divisions — store and office properties, manufacturing properties, and storage properties — dominated the large-loss fire experience both in the frequency of large-loss fires and the resulting property loss.

Large-Loss Fires ($1 Million or More) by Specific Property Use (1980)

Property Use	*No. of Large-Loss Fires*	*Loss*	*Total No. of Large-Loss Fires for Major Property Uses*	*Total Loss for Major Property Uses*
Public Assembly			26	$60,210,000
Bowling establishments	3	$ 3,500,000		
Racetrack	1	20,000,000		
Churches	7	12,780,000		
Country clubs	3	5,800,000		
Historic buildings	2	2,750,000		
Restaurants, drinking places	7	10,650,000		
Theaters	3	4,730,000		
Educational			27	52,801,800
Public schools	22	40,113,000		
Residential schools	2	7,071,600		
Colleges	2	4,050,000		
Other educational	1	1,567,200		
Institutional			1	1,800,000
Prison	1	1,800,000		
Residential			25	93,594,500
Private dwellings	3	8,275,000		
Apartments	15	24,600,000		
Hotels	5	57,084,000		
Dormitories	2	3,635,500		
Stores and Offices			53	97,692,200
Food, beverage sales	4	4,325,000		
Clothing, fabric sales	3	3,000,000		

Large-Loss Fires ($1 Million or More) by Specific Property Use (1980) (Continued)

Property Use	*No. of Large-Loss Fires*	*Loss*	*Total No. of Large-Loss Fires for Major Property Uses*	*Total Loss for Major Property Uses*
Furniture, appliance sales	12	18,500,000		
Drugstore	1	1,000,000		
Recreation, hobby, home repair	5	7,634,000		
Linen supply	1	1,000,000		
Vehicle sales/repair	3	4,000,000		
General-item stores	13	29,038,200		
Offices	10	27,515,000		
Other stores	1	1,680,000		
Basic Industry, Utility, Defense			17	49,570,000
Non-nuclear energy production	5	28,720,000		
Communication facility	1	2,000,000		
Energy distribution systems	2	3,000,000		
Fruit packing plants	2	4,500,000		
Forests	3	6,000,000		
Coal mine	1	1,000,000		
Mineral product manufacture	3	4,350,000		
Manufacturing			81	339,510,700
Food	6	11,635,000		
Textile	3	5,835,000		
Clothing, rubber manufacture	4	6,440,000		
Wood, furniture, paper, printing	18	47,199,900		
Chemical, plastic, petroleum	16	61,962,800		
Metal, metal products	9	33,911,500		
Other manufacturing	7	35,061,500		
Storage			72	172,950,000
Agricultural products	4	6,720,000		
Textile, textile products	4	12,083,500		
Processed food, beverage	3	8,710,000		
Petroleum, petroleum products	10	20,301,000		
Wood, paper products	23	56,316,000		
Chemical, plastic products	5	10,100,000		
Metal, metal products	3	15,023,500		
Vehicles	6	14,666,000		
General-item storage	14	29,030,000		
Special Properties			21	80,674,900
Under construction, unoccupied	15	35,707,500		
Outdoor properties (brush) including structures	2	40,233,900		
Rail transport	3	3,733,500		
Road transport	1	1,000,000		
TOTAL:			323	$948,804,100

Large-Loss Fires ($500,000 or More) by Specific Property Use
United States 1978 & 1979

Property Use	1978 Number of Fires	1978 Dollar Loss	1979 Number of Fires	1979 Dollar Loss
Public Assembly				
Bowling, amusement places	4	$ 3,000,000	5	$ 3,436,500
Ballroom, gymnasium, arena	2	22,000,000	2	1,080,000
Churches, funeral parlors	15	12,911,400	26	29,587,900
Clubs	5	4,400,000	9	8,440,200
Libraries, museums, courthouse	3	9,355,000	0	0
Restaurants, nightclubs, taverns	13	11,587,000	20	18,673,000
Passenger terminals	0	0	3	2,800,000
Theaters, studios	2	2,000,000	3	14,000,000
	44	$ 65,253,400	68	$ 78,017,800
Educational				
Nonresidential schools (thru 12th grade)	20	23,404,800	26	27,232,000
Trade, business schools	3	1,900,000	2	1,000,000
Colleges	0	0	2	11,250,000
Other educational	2	1,500,000	0	0
	25	$26,804,800	30	$39,482,000
Institutional				
Care of the aged	1	850,000	0	0
Hospital, clinic	0	0	2	2,500,000
Prison	2	3,526,600	1	1,200,000
	3	$ 4,376,600	3	$ 3,700,000
Residential				
Private dwelling	7	6,800,000	2	2,100,000
Apartment buildings	21	20,270,900	22	46,228,800
Hotels, motels	13	12,401,700	15	19,273,900
Dormitories	4	2,950,000	2	3,000,000
	45	$ 42,422,600	41	$ 70,602,700
Stores and Offices				
Food and beverage sales	9	9,187,500	14	20,904,000
Clothing, fabric sales	5	3,695,000	6	6,624,100
Household goods sales	19	16,304,000	11	7,612,200
Drugstores, luggage sales	2	4,250,000	8	5,162,000
Recreation, hobby, home repair	6	4,973,500	7	7,617,800
Professional supplies/sales	2	3,850,000	2	2,000,000
Motor vehicle sales, service/repair	11	7,400,000	13	16,255,900
General item stores	21	44,389,000	21	39,631,600
Offices	12	9,300,000	22	27,640,400
Other stores	7	9,500,000	2	1,000,000
	94	$112,849,000	106	$134,448,000
Basic Industry, Utility, Defense				
Non-nuclear energy production	5	4,350,000	6	4,517,800
Laboratories	0	0	4	4,060,000
Communications, defense, document facility	3	2,760,000	6	10,051,000
Energy distribution, sewage plant	6	6,805,000	5	6,500,000
Fruit packing plant	0	0	2	6,500,000
Farms	2	1,500,000	0	0
Forests	3	14,259,000	7	8,550,000
Mining	1	800,000	3	4,000,000
Mineral product manufacturer	3	5,750,000	4	2,925,000
	23	$ 36,224,000	37	$ 47,103,800

Large-Loss Fires ($500,000 or More) by Specific Property Use
United States 1978 & 1979 (Continued)

Property Use	1978 Number of Fires	1978 Dollar Loss	1979 Number of Fires	1979 Dollar Loss
Manufacturing				
Food, beverage, tobacco processing	13	23,425,000	18	22,046,600
Textile	5	5,207,400	1	6,300,000
Rubber, rubber products	2	2,300,000	7	7,806,000
Wood furniture, paper, printing	22	37,311,400	39	43,924,100
Chemical, plastic, petroleum products	29	63,281,700	29	45,884,000
Metal, metal products	17	18,081,100	34	48,257,000
Vehicle assembly/manufacture	6	5,885,000	2	1,264,400
Other manufacturing	13	11,082,500	11	12,175,000
	107	$166,574,100	141	$187,657,100
Storage				
Agricultural products	15	$ 17,631,000	18	$ 32,706,000
Textile products	5	6,260,000	6	7,626,000
Processed food, beverage, tobacco	7	16,288,600	5	6,726,000
Petroleum products, alcoholic beverage	6	4,600,000	12	16,277,000
Wood, paper products	23	25,073,300	31	37,167,000
Chemical, plastic products	6	5,751,500	11	45,340,000
Metal, metal products	4	12,850,000	16	21,439,500
Vehicles	13	12,362,000	11	11,300,000
General item storage	18	42,615,300	26	41,064,400
Other storage	6	4,900,000	2	1,650,000
	103	$148,331,700	138	$221,295,900
Special Properties				
Under construction, unoccupied	16	18,767,700	26	27,665,000
Outdoor properties (brush)	2	43,364,000	10	30,122,900
Water transport, drilling platforms	0	0	12	156,829,400
Rail transport	0	0	3	10,358,500
Road transport	0	0	2	2,500,000
Aircraft	1	30,000,000	1	3,200,000
Construction equipment	0	0	1	600,000
Other special properties	9	10,017,200	0	0
	28	$102,148,900	55	$231,275,800
TOTALS:	472	$704,985,100	619	$1,013,582,900

HOW LARGE-LOSS FIRES START

The following tables present ignition scenarios for three major property divisions that traditionally dominate both in the frequency of large-loss fires and the resulting dollar loss. The tables show the leading causes of fire resulting in a loss of $500,000 or more for store, manufacturing, and storage properties for the ten year period 1971–1980. The tables are based on individual fires reported to the NFPA for which both the form of heat of ignition and the ignition factor were determined.

Ignition Scenarios of Store Properties, United States, 1971–1980

Form of Heat of Ignition	*Ignition Factor*	*Percent of Fires*	*Percent of Dollar Loss*
Electrical equipment arcing, overloaded	Mechanical failure, malfunction	35.7	37.6
Open flame, incendiary device	Incendiary	25.6	23.6
Heating system	Mechanical failure, malfunction	5.5	4.1
Heating system	Combustibles too close	3.0	2.8
Cigarette	Carelessly discarded	4.0	6.4

Based on 199 fires resulting in a dollar loss of $500,000 or more reported in the NFPA FIDO data. All dollar losses adjusted to 1971 dollars, using the Producer Price Index; total adjusted dollar loss was $119,278,500.

All percentages in this Table refer to this data set.

Out of 33 distinct scenarios in this data set, the five scenarios accounted for 73.8 percent of the fires and 74.5 percent of the dollar loss.

Ignition Scenarios of Manufacturing Properties, United States, 1971–1980

Form of Heat of Ignition	*Ignition Factor*	*Percent of Fires*	*Percent of Dollar Loss*
Electrical equipment arcing, overloaded	Mechanical failure, malfunction	22.1	24.3
Heat from hot object (friction, molten or hot material)	Mechanical failure, malfunction	11.8	12.1
Heat from hot object (friction, molten or hot material)	Operational deficiency	4.1	3.6
Open flame, incendiary device	Incendiary	10.9	10.4
Fuel fired process equipment, heating systems	Mechanical failure, malfunction	8.6	10.7

Ignition Scenarios of Manufacturing Properties, United States, 1971-1980 (Continued)

Form of Heat of Ignition	*Ignition Factor*	*Percent of Fires*	*Percent of Dollar Loss*
Torches (cutting, welding)	Cutting, welding too close to combustibles	8.0	11.3
Spontaneous ignition, chemical reaction	Operational deficiency	4.7	2.6
Cigarette	Carelessly discarded	3.0	1.6

Based on 339 fires resulting in a dollar loss of $500,000 or more reported in the NFPA FIDO data. All dollar losses adjusted to 1971 dollars, using the Producer Price Index; total adjusted dollar loss was $344,388,380.

All percentages in this Table refer to this data set.

Out of 49 distinct scenarios in this data set, the eight scenarios accounted for 73.2 percent of the fires and 76.6 percent of the dollar loss.

Ignition Scenarios of Storage Properties, United States, 1971-1980

Form of Heat of Ignition	*Ignition Factor*	*Percent of Fires*	*Percent of Dollar Loss*
Open-flame incendiary device	Incendiary	21.9	16.5
Electrical equipment arcing, overloaded	Mechanical failure, malfunction	17.9	16.8
Torches (cutting, welding)	Cutting, welding too close to combustibles	6.2	7.9
Heat from hot object	Mechanical failure, malfunction	6.2	6.1
Heating systems	Mechanical failure, malfunction	4.7	4.1
*Exposure fire	Property too close	3.7	11.9
Cigarette	Carelessly discarded	3.7	4.9
Natural source	Lightning	3.7	3.1
Spontaneous ignition, chemical reaction	Operational deficiency	3.7	2.4

Based on 274 fires resulting in a dollar loss of $500,000 or more reported in the NFPA FIDO data. All dollar losses adjusted to 1971 dollars, using the Producer Price Index; total adjusted dollar loss was $248,581,250.

All percentages in this Table refer to this data set.

Out of 49 distinct scenarios in this data set, the nine scenarios accounted for 71.7 percent of the fires and 73.7 percent of the dollar loss.

*The disproportionate dollar loss percentage for this ignition scenario was influenced by a major fire that resulted in a total of $28 million in property damage to two warehouses.

INDIRECT COSTS OF BUSINESS FIRES

The cost of fire extends beyond deaths, injuries, and property loss, as tragic as these are. Substantial indirect losses also result from fire. The following two lists note many of these losses for the community and businesses involved.

Losses to the Fire-damaged Business

Business interruption as a result of a fire may have one or more of the following effects:

1. Loss of customers.
2. Loss of return on capital investment.
3. Loss of profits on finished goods.
4. Loss of investors' confidence.
5. Loss of credit standing.
6. Loss of good will of customers, employees, and the community.
7. Loss of trained personnel who transfer to other jobs.
8. Cost of retaining key personnel during shutdown.
9. Loss of productive services of key personnel retained during enforced shutdown.
10. Seizure of fire insurance payments by uneasy creditors.
11. Excessive replacement costs due to overtime, inability to buy at time most advantageous to buyer, etc.
12. Cost of demolition.
13. Cost of replacing depreciated buildings and equipment with new facilities.
14. Continuance of fixed charges during shutdown.
15. Cost of hiring temporary quarters.
16. Loss of valuable records, EDP storage, one of a kind molds and other items that cannot be replaced or can be replaced only at great cost.
17. Loss of earning power of patents, trademarks, etc.
18. Loss of value of past advertising.
19. Inability to defend against unjust claims due to loss of records.
20. Loss of rent from tenants.

Losses to the Community

The business itself and the employees involved are not the only "losers" in the event of a fire. The whole community also suffers in the following ways:

1. Loss of circulation of employees' payroll.
2. Increased burden on welfare and unemployment compensation funds.
3. Loss of business by suppliers of raw materials and services to fire-damaged plant.
4. Loss of labor market.
5. Loss of taxes on destroyed property.

INDIRECT COSTS OF RESIDENTIAL FIRES

Based on data obtained from a nationwide sample of households, Munson and Ohls reported on national estimates of the magnitude of indirect residential costs. Indirect costs were defined as those costs other than the value of direct damage to structures and contents where a monetary value could be assigned. The indirect costs identified were: medical costs, temporary shelter costs, costs of missed work, extra meal costs, demolition costs, and legal fees.*

*Munson, Michael J. and Ohls, James C., *Indirect Costs of Residential Fires*. Prepared by Princeton University and Mathematics Policy Research, Inc. for the Federal Emergency Management Agency, U.S. Fire Administration, Washington, D.C., 1979.

Estimates of national indirect residential fire losses by cost component are displayed in the table below. Both total costs to society regardless of who bore them and out-of-pocket costs borne only by the households which experienced the fires were estimated. Although the estimates reflect the overall magnitude of indirect costs of residential fires, they may be subject to substantial sampling error. Over half of the total national losses were borne by persons or organizations other than individual households.

The largest single component of total costs was temporary shelter, which accounted for 44.8% of these costs. The top three components — temporary shelter, medical care, and costs due to missed work — accounted for 81.1% of total costs and 76.2% of out-of-pocket expenses. Medical care was the largest single component of out-of-pocket costs (37.8%), followed by temporary shelter (21.5%), and expenses incurred from missed work (16.9%). Sources of assistance to households in meeting these costs included friends and relatives (about 66% of households received aid from this source to meet temporary shelter costs), insurance companies (the primary source for meeting medical expenses), government agencies, and private support organizations such as the Red Cross.

Summary of National Indirect Cost Estimates
(In $ Millions)
For Residential Fires in the United States

Cost Component	502,000 Fires		665,400 Fires		700,000 Fires		735,000 Fires		Percent	
	Total Cost	Out-of-Pocket Cost	Total Cost	Out-of-Pocket Cost	Total Cost	Out-of-Pocket Cost	Total Cost	Out-of-Pocket Cost	Total Cost	Out-of-Pocket Cost
Temporary shelter	$98.7	$22.6	$130.8	$29.9	$137.7	$31.5	$144.5	$33.1	44.8%	21.5%
Medical Care[1]	53.7	39.7	71.3	52.6	75.0	55.3	78.7	58.1	24.4	37.8
Missed Work	26.2	17.8	34.8	23.5	36.5	24.7	38.4	26.0	11.9	16.9
Funeral	8.1	2.6	10.8	3.5	11.4	3.7	11.9	3.8	3.7	2.5
Extra Food	9.7	6.6	12.9	8.8	13.5	9.2	14.2	9.7	4.4	6.3
Emotional Counseling	4.6	0.8	6.1	1.1	6.5	1.2	6.8	1.2	2.1	0.8
Demolition	4.0	2.4	5.3	3.2	5.5	3.4	5.8	3.5	1.8	2.3
Legal Fees	2.9	2.0	3.8	2.7	4.0	2.8	4.2	2.9	1.3	1.9
Transportation	1.8	1.5	2.3	1.9	2.5	2.0	2.6	2.2	0.8	1.4
Child Care	0.7	0.4	0.9	0.6	0.9	0.6	1.0	0.7	0.3	0.4
Other	9.9	8.6	13.1	11.4	13.8	12.0	14.5	12.6	4.5	8.2
TOTALS	$220.3	$105.0	$292.1	$139.2	$307.3	$146.4	$322.6	$153.8	100.0%	100.0%

[1]It is possible that medical care costs may be somewhat understated.
Source: Munson & Ohls, *Indirect Costs of Residential Fires*, page 9.
Estimated costs are for 1976 stated in early 1977 dollars.

HOTEL FIRES

MGM Grand, Las Vegas, Hilton — not so long ago, these hotels were noted for luxury. Now they are remembered mainly for the tragic fires that took place within their walls.

Since 1971, data indicates that hotel fires usually start in bedrooms, living rooms, storage areas, laundry rooms, and means of egress. The heat of ignition is usually supplied by cigarettes, matches, electrical equipment, and sometimes by human hands. For fatal hotel fires, the chance that the cause was incendiarism increases as the number of fatalities increases. For example, in hotel fires where there were one or two fatalities, suspicious or incendiary fires accounted for 11% of the total incidents, compared to fires that resulted in five or more fatalities where the data shows that 50% of the fires were incendiary or suspicious.

Cigarettes or smoking materials are the most frequent form of heat of ignition for accidental fire causes. These fires usually start in bedrooms. Electrical equipment is another common form of heat of ignition in accidental hotel fires.

Leading Ignition Scenarios in Fatal Hotel Fires (1971–1981)

Ignition Factor	Area of Origin	Form of Heat of Ignition	Percent of Incidents	Percent of Deaths
One- and Two-Fatality Fires				
Accidental	Bedroom	Cigarette (Smoking Materials)	56.63	52.16
	Bedroom	Electrical Equipment, Arcing/Overloaded	4.41	4.97
	Bedroom	Match/Open Flame	3.69	4.96
	Living Room	Cigarette	3.66	3.72
	Means of Egress	Cigarette	2.21	2.48
	Structural Area	Electrical Equipment, Arcing/Overloaded	1.47	2.48
	Bedroom	Properly Operating Electrical Equipment	1.47	1.24
Incendiary, Suspicious	Bedroom	Match/Open Flame	3.68	4.97
	Storage Area	Incendiary Device	1.47	1.24
Three+ Fatality Fires				
Accidental	Bedroom	Cigarette	20.59	16.85
	Storage Area	Electrical Equipment, Arcing/Overloaded	8.82	10.11
	Structural Area	Electrical Equipment, Arcing/Overloaded	8.82	9.55
	Bedroom	Match/Open Flame	5.88	5.62
	Bedroom	Electrical Equipment, Arcing/Overloaded	5.88	4.49
	Laundry Room	Electrical Equipment, Arcing/Overloaded	5.88	3.37
Incendiary, Suspicious	Means of Egress	Match/Open Flame	17.65	19.66
Five+ Fatality Fires				
Accidental	Bedroom	Cigarette	16.67	11.65
	Storage Area	Electrical Equipment, Arcing/Overloaded	8.33	11.65
	Structural Area	Electrical Equipment, Arcing/Overloaded	8.33	9.71
	Bedroom	Match/Open Flame	8.33	5.83
	Bedroom	Electrical Equipment, Arcing/Overloaded	8.33	4.85
Incendiary, Suspicious	Means of Egress	Match/Open Flame	25.00	25.24
	Multiple Location	Incendiary Device	8.33	19.42
	Bedroom	Match/Open Flame	8.33	6.80
	Multiple Locations	Match/Open Flame	8.33	4.85

This table was based upon 170 fatal hotel fires reported to the NFPA since 1971. 136 of the fires were one- and two-fatality incidents that resulted in 161 civilian deaths. 34 of the fires were three or more fatality incidents, resulting in 178 civilian deaths. 12 of these fires and 103 of the deaths occured in incidents that killed five or more. Because these are *leading* ignition scenarios, the totals will not add up to 100 percent.

Chronological List of Multiple-Death U.S. Hotel Fires

City	Hotel	Date	Number Killed
Lansing, Mich.	Kerns Hotel	12/11/34	35
Atlanta, Ga.	Terminal Hotel	5/16/38	32
Minneapolis, Minn.	Marlborough Hotel	1/3/40	19
Houston, Tex.	Gulf Motel	8/7/43	54
Chicago, Ill.	LaSalle Hotel	6/5/46	61
Dubuque, Iowa	Canfield Hotel	6/9/46	19
Atlanta, Ga.	Winecoff Hotel	12/7/46	119
Chicago, Ill.	Barton Hotel	2/12/55	29
Houston, Tex.	Town Motel	9/14/60	4
San Francisco, Calif.	Thomas Hotel	1/6/61	3
Gilroy, Calif.	Rainboro Court	11/21/61	3
Boston, Mass.	Sherry Biltmore Hotel	3/29/63	4
Atlantic City, N.J.	Surfside Hotel	11/18/63	25
Jacksonville, Fla.	Roosevelt Hotel	12/29/63	22
Omaha, Nebr.	Eagle Hotel	1/15/65	3
Plainfield, N.J.	Victoria Hotel	6/11/65	3
Parksville, N.Y.	Prospect Inn	8/11/65	5
Newark, N.J.	Military Park Hotel	12/14/65	4
St. Paul, Minn.	Hotel Carlton	1/6/66	12
Albin, W.Y.	Main Hotel	1/10/66	3
Boston, Mass.	Paramount Hotel	1/28/66	11
Green Bay, Wis.	Astor Hotel	2/4/66	8
Chicago, Ill.	Garfield Arms Hotel	2/22/66	3
Carthage, Mo.	Carthage Hotel	6/5/66	3
Anchorage, Alaska	Lane Hotel	9/12/66	14
Anderson, Ind.	Central Hotel	10/22/66	3
Island Park, N.Y.	Island Park Hotel	12/3/66	3
Los Angeles, Calif.	Post Hotel	1/2/67	6
Las Vegas, Nev.	Orbit Inn Motel	1/6/67	6
Chicago, Ill.	Security Hotel	1/10/67	5
Rochester, Minn.	Norton Hotel	2/6/67	3
Joliet, Ill.	Grand Hotel	2/11/67	9
Atlanta, Ga.	Ivy Hotel	2/23/67	4
Minneapolis, Minn.	Kenesaw Hotel	5/1/67	4
Ellensburg, Wash.	Antlers Hotel	10/24/67	4
Chicago, Ill.	Claredon Hotel	11/16/67	3
Denver, Colo.	Denver Hotel	12/7/67	3
Brownsville, Pa.	Pennsylvania Hotel	1/15/68	3
Boston, Mass.	Hotel Roosevelt	2/4/68	9
Worcester, Mass.	Hotel Pleasant	2/17/68	3
Helena, Mont.	Grandon Hotel	3/14/68	3
Omaha, Nebr.	Jackson Hotel	3/26/68	5
Greenville, Me.	Squaw Mountain Inn	6/30/68	5
Darlington, S.C.	Park Terrace Hotel	11/27/68	4
Paterson, N.J.	Midtown Hotel	12/10/68	6
Cleveland, Ohio	A & A Hotel	12/19/68	5
New Castle, Pa.	Fountain Inn Hotel	12/24/68	3
Chicago, Ill.	Green Briar Hotel	1/12/69	5
Alamogordo, N. Mex.	Wilward Hotel	2/2/69	3
San Francisco, Calif.	International Hotel	3/16/69	4
Perth Amboy, N.J.	Packer Hotel	3/17/69	4
Biddeford, Me.	Central Hotel	4/13/69	5
Asbury Park, N.J.	Hotel Breslin	4/20/69	3
Cimarron, N. Mex.	Kit Carson Inn	6/16/69	3

(Continued on next page)

Chronological List of Multiple-Death U.S. Hotel Fires (Continued)

City	*Hotel*	*Date*	*Number Killed*
Seattle, Wash.	Ozark Hotel	3/20/70	20
Los Angeles, Calif.	Ponet Square Hotel	9/13/70	19
Tucson, Ariz.	Pioneer International	12/20/70	28
Canandaigua, N.Y.	Canandaigua Inn	3/29/71	8
Chicago, Ill.	Colonial House Hotel	4/14/71	4
Cleveland, Ohio	Hotel Pick Carter	4/ /71	4
Miami, Fla.	Columbus Hotel	5/6/71	3
St. Louis, Mo.	Ambassador Hotel	5/14/71	4
Wilkes-Barre, Pa.	Quinn's Hotel	6/11/71	3
New Orleans, La.	Howard Johnson's	7/23/71	6
Springfield, Ill.	Hotel	1/5/72	4
Toppenish, Wash.	Washington Hotel	1/5/72	9
Reading, Pa.	Bert & Alfredo Hotel	1/7/72	3
Tyrone, Pa.	Hotel Pennsylvania House	1/16/72	12
Fairbanks, Alaska	Nordale Hotel	2/22/72	4
Los Angeles, Calif.	Barclay Hotel	3/16/72	3
San Antonio, Tex.	Holiday Hotel	7/16/72	5
Philadelphia, Pa.	St. Charles Hotel	8/26/72	3
Rutland, Vt.	Town House Hotel	1/7/73	5
Lakewood, N.J.	Manhattan Hotel	5/1/73	5
New Philadelphia, Pa.	Chesterfield Hotel	7/5/73	5
Bath, Me.	Hotel Sedgwick	9/9/73	4
Omaha, Nebr.	Palace Hotel	1/6/74	3
Duluth, Minn.	Crossroads Inn	3/21/74	4
Denver, Colo.	Lewiston Hotel	4/10/74	5
Bush Kill, Pa.	Samuel Felder Hotel	4/25/74	3
Houston, Tex.	Dixie Hotel	7/3/74	3
Berkely Springs, W. Va.	Washington House Hotel	8/27/74	12
Lynn, Mass.	Oxford Hotel	8/27/74	4
Lansford, Pa.	Aquila Hotel	4/10/75	3
Portland, Ore.	Pomona Hotel	7/7/75	12
Shreveport, La.	Grand Hotel	9/5/75	3
Fremont, Nebr.	Pathfinder Hotel	1/10/76	20
Miami, Fla.	Avondale Hotel	4/2/76	7
Rocky Mount, N.C.	Terminal Hotel	11/27/76	4
San Francisco, Calif.	Sincere Hotel	11/27/76	4
Holton, Kans.	City Hotel	12/12/76	5
Shamokin, Pa.	Walnut Towers Motor Inn	1/2/77	9
Breckenridge, Minn.	Stratford Hotel	1/28/77	16
Chicago, Ill.	Pacific Hotel	1/31/77	3
Galveston, Tex.	Central Hotel	4/19/77	8
Fort Pierre, S. Dak.	OAHE Motel	4/23/77	3
Baltimore, Md.	New Sherwood Hotel	5/15/77	3
Cokato, Minn.	Cokato Hotel	6/8/77	5
Devils Lake, N. Dak.	Colonial Hotel	6/8/77	6
Chicago, Ill.	Hotel Toledo	10/23/77	7
Columbia, Ky.	Miller Hotel	11/1/77	5
New Castle, Pa.	Holiday Inn	11/3/77	4
Baycity, Mich.	Wenonah Park Hotel	12/10/77	10
Newark, N.J.	Hotel Lucerne	12/30/77	8
Grundy, Va.	Davis Hotel	1/3/78	3
Kansas City, Mo.	Contes House Hotel	1/28/78	20
Sheboygan, Wis.	Kneevers Hotel	2/12/78	3

Chronological List of Multiple-Death U.S. Hotel Fires (Continued)

City	*Hotel*	*Date*	*Number Killed*
Fairfax, Va.	Brook's Motor Lodge	5/8/78	5
Jellico, Tenn.	Jenkins Hotel	5/16/78	7
San Francisco, Calif.	Maranonte Hotel	6/21/78	4
Neenah, Wis.	Bottle & Barrel Island Inn	9/9/78	3
Honesdale, Pa.	Allen Motor Inn	11/5/78	12
Greece, N.Y.	Holiday Inn	11/26/78	10
Potrero, Calif.	Rolling Oaks	11/29/78	4
Los Banos, Calif.	Hub Hotel	11/29/78	4
San Jose, Calif.	Mission Hotel	1/9/79	3
Payette, Idaho	Bancroft Hotel	1/19/79	4
Pocono Summit, Pa.	Ontwood Hotel	5/9/79	3
Cambridge, Ohio	Holiday Inn	7/31/79	9
Lakewood, N.J.	Lincoln Hotel	11/5/79	3
Caruthersville, Mo.	Chiffin Motor Hotel	11/19/79	3
Ogden, Utah	Reed Hotel	12/7/79	7
Elkhart, Ind.	Swiss Inn	1/27/80	5
Detroit, Mich.	Columbia Hotel	2/11/80	3
Wells, Nev.	Ranch House Motel	7/27/80	4
Denver, Colo.	Jefferson Hotel	8/12/80	3
Las Vegas, Nev.	MGM Grand Hotel	11/21/80	85
Las Vegas, Nev.	Hilton Hotel	2/10/81	8

This table includes multiple-death hotel fires reported to the NFPA since 1960. It also includes major hotel fires reported to the NFPA prior to 1960.

FIRE FIGHTER DEATHS AND INJURIES

Because fire fighters work in hazardous environments, they face special health hazards that increase the risk of accidental death and injury. Fatal accidents and injuries may not be entirely preventable, but understanding how they occur is necessary so that specific corrective actions can be developed to minimize the inherent risks.

NFPA studies fire fighter deaths and injuries to provide national statistics on their frequency, extent, and characteristics and, ultimately, to improve the safety of all fire fighters.

FIRE FIGHTER DEATHS IN THE LINE OF DUTY BY YEAR, CAUSE, AND NATURE OF FATAL INJURY

By year, the number of recent fire fighter deaths in the line of duty for 1977–1980 are:

1977 — 134
1978 — 162
1979 — 113
1980 — 134

There is no consistent trend of fire fighter deaths increasing or decreasing during the four year period; however, with each year's fire fighter fatality total well over 100, it is important to understand the characteristics, causes, and nature of these fatalities.

The distribution of fire fighter deaths by cause and nature of fatal injury for the four totals are presented in the table below; 543 fire fighter deaths were verified by the NFPA for the four years. By cause of fatal injury, stress was the leading factor accounting for over 42% of all fire fighter deaths during the four year period. The next largest proportion of deaths (29.3%) resulted from falls, being struck by an object, or contact with an object. Fire fighter exposure to fire products resulted in 16.4% of fire fighter deaths, and structural collapse accounted for 8.1% of the fire fighter fatalities.

By nature of fatal injury for the 1977–1980 period, the leading type of fatal injury to fire fighters was heart attack which accounted for 42.9% of all fire fighter fatalities; over the 1975–1980 period the annual proportion of deaths from heart attacks ranged from 38.9 to 46.1%. The substantially high proportion of heart attacks among fire fighters stresses the need for improving health maintenance and physical fitness activities to prevent the damaging effects of cardiovascular disease. About 15% of the fatal injuries were smoke inhalation or burns and smoke inhalation combined. The conscientious use of protective equipment, particularly self-contained breathing apparatus, is vital to the campaign to reduce inhalation injuries. Wounds, cuts, and bleeding accounted for 13.8% of all fire fighter fatalities during the 1977–1980 period. Dislocation, fracture was the fatal injury in 12.9% of the cases.

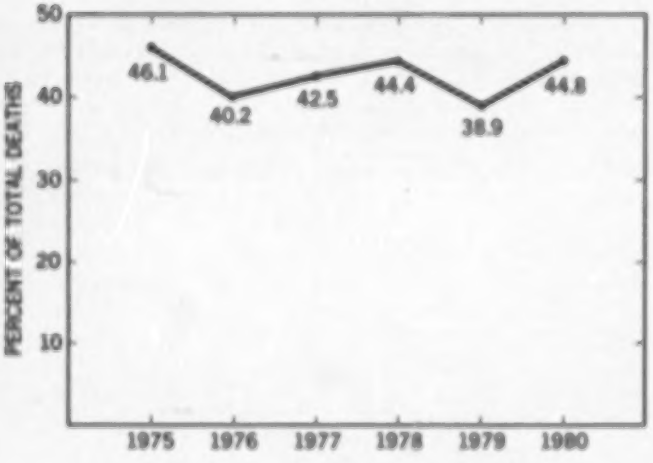
Fire Fighter Deaths in the Line of Duty by Cause and Nature of Fatal Injury for Four Year Totals (1977-80)

Cause of Fatal Injury	Fire Fighter Deaths (Total for 1977-80) Number	Percent
Stress	230	42.4
Falls, struck by object, contact with object	159	29.3
Exposure to fire products	89	16.4
Structural collapse	44	8.1
Exposure to chemicals or radiation	9	1.7
Other	12	2.1

Nature of Fatal Injury	Number	Percent
Heart Attack	233	42.9
Wound, cut bleeding	75	13.8
Smoke inhalation only	61	11.2
Burns only	32	5.9
Burns and smoke inhalation	19	3.5
Dislocation, fracture	70	12.9
Shock	13	2.4
Internal injury	21	3.9
Drowning	16	2.9
Other	3	.6

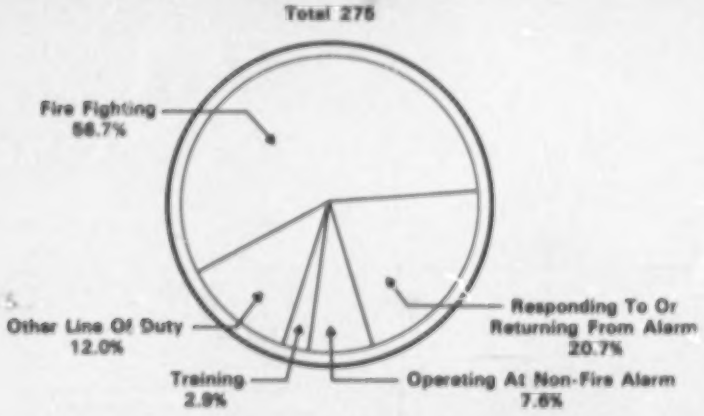
Total fire fighter deaths for 1977-1980 period verified by the NFPA was 543.

Proportion of Deaths From Heart Attack, 1975-1980



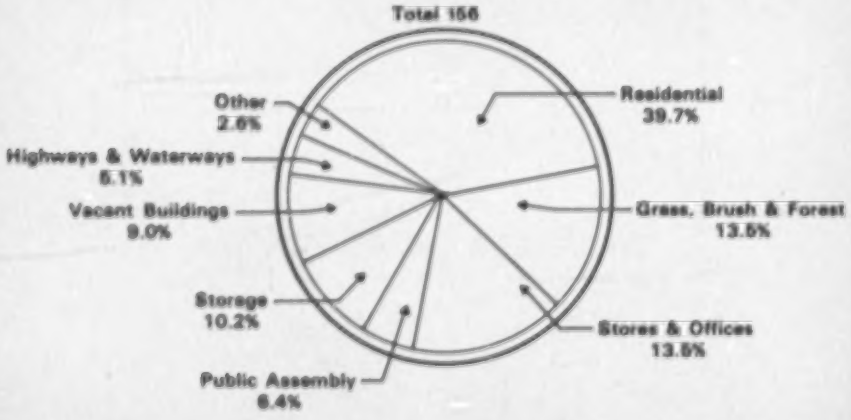
FIRE FIGHTER DEATHS BY TYPE OF DUTY

The figure below presents the distribution of line-of-duty fire fighter deaths by type of duty for 1978–1979. Over half of the deaths occurred on the fireground (56.7%), followed by responding to or returning from an alarm (20.7%), and other line of duty (12.0%). ("Other line of duty" includes inspection duties and general activities around the fire station.)



FIREGROUND DEATHS BY FIXED PROPERTY USE

The figure below presents the proportion of fireground deaths by property type for 1978–1979. The largest proportion of fireground deaths occurred in residential properties (39.7%). This is not surprising since residential fires account for about 70% of all structure fires annually in the U.S. Other properties with a high proportion of fire fatalities were: stores and offices (13.5%), grass, brush, and forest (13.5%), storage (10.2%), and vacant buildings (9.0%).

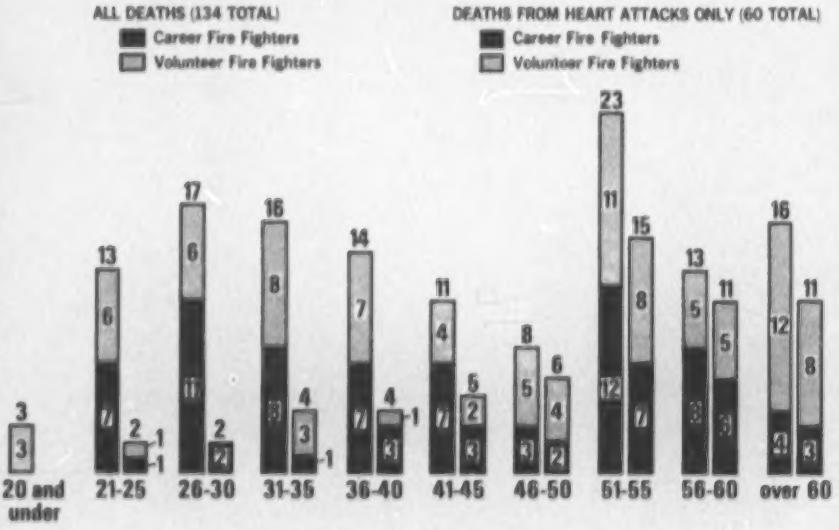


AGES OF FIRE FIGHTERS

The figure below displays the age distribution of fire fighter fatalities for all deaths, and deaths from heart attacks only for career and volunteer fire fighters (1980). The lowest number of deaths occurred in fire fighters 20 years and under (3 deaths). The number of deaths climbed to an initial peak at 26–30 years (17 deaths), declined again, and reached the highest peak at 51–55 years (23 deaths).

As in the previous two years, the age distribution for heart attack deaths indicated the proportion of deaths from heart attacks was substantially higher in older fire fighters than in younger fire fighters.

Ages of Fire Fighters Who Died in the Line of Duty, 1980



CAREER AND VOLUNTEER FIRE FIGHTER FATALITIES

The following three tables present fire fighter deaths broken down between career and volunteer fire fighters as they appeared in the annual fire fighter fatality reports (1978–1980). The selected breakdowns include: type of duty, cause of fatal injury, nature of fatal injury, ages of fire fighters, and fireground deaths by fixed property use.

Comparison of Line-of-Duty Deaths between Career and Volunteer Fire Fighters, 1980

	Career fire fighters		Volunteer fire fighters[a]	
	Number of deaths	*Percent of deaths*	*Number of deaths*	*Percent of deaths*
Type of duty				
Operating at fire ground	46	68.7	35	52.2
Responding to or returning from alarm	4	6.0	22	32.8
Operating at nonfire alarm	5	7.4	5	7.5
Training	2	3.0	3	4.5
Other line of duty	10	14.9	2	3.0
Totals	67	100.0	67	100.0
Cause of fatal injury				
Exposure to fire products	9	13.4	6	8.9
Structural collapse	11	16.4	3	4.5
Falls, struck by object, contact with object	19	28.4	27	40.3
Stress	28	41.8	31	46.3
Totals	67	100.0	67	100.0
Nature of fatal injury				
Burns and smoke inhalation	3	4.5	1	1.5
Burns only	5	7.4	2	3.0
Smoke inhalation only	6	8.9	4	6.0
Wound, cut, bleeding	0	0.0	4	6.0
Dislocation, fracture	16	23.9	18	26.9
Heart attack	28	41.8	32	47.6
Shock	2	3.0	1	1.5
Internal injury not classified above	4	6.0	1	1.5
Drowning	2	3.0	4	6.0
Other	1	1.5	0	0.0
Totals	67	100.0	67	100.0
Ages of fire fighters				
All deaths				
20 and under	0	0.0	3	4.5
21 to 25	7	10.5	6	9.0
26 to 30	11	16.4	6	9.0
31 to 35	8	11.9	8	11.9
36 to 40	7	10.5	7	10.4
41 to 45	7	10.5	4	6.0
46 to 50	3	4.5	5	7.5
51 to 55	12	17.9	11	16.4
56 to 60	8	11.9	5	7.5
over 60	4	6.0	12	17.9
Totals	67	100 0	67	100.0

[a]For this report the term "volunteer" refers to any fire fighter who is not a full-time, paid member of a fire department.

[b]Since these attributes are not mutually exclusive, totals and percentages are not shown.

Comparison of Line-of-Duty Deaths between Career and Volunteer Fire Fighters, 1980 (Continued)

	Career fire fighters		Volunteer fire fighters[a]	
	Number of deaths	*Percent of deaths*	*Number of deaths*	*Percent of deaths*
Ages of fire fighters				
Deaths from heart attacks only				
21 to 25	1	3.6	1	3.1
26 to 30	2	7.2	0	0.0
31 to 35	1	3.6	3	9.4
36 to 40	3	10.7	1	3.1
41 to 45	3	10.7	2	6.3
46 to 50	2	7.1	4	12.5
51 to 55	7	25.0	8	25.0
56 to 60	6	21.4	5	15.6
over 60	3	10.7	8	25.0
Totals	28	100.0	32	100.0
Fire ground deaths by fixed property use				
Public assembly	3	6.5	3	8.6
Construction sites	2	4.3	0	0.0
Residential	17	37.0	14	40.0
Stores, offices	5	10.9	1	2.9
Storage	4	8.7	5	14.3
Vacant buildings	5	10.9	1	2.9
Highways, streets	1	2.2	2	5.7
Grass, brush, forest	7	15.2	6	17.1
Manufacturing	1	2.2	2	5.7
Educational	1	2.2	0	0.0
Dumps	0	0.0	1	2.9
Totals	46	100.0	35	100.0
Rank				
Fire fighter	38	56.7	51	76.1
Company officer	23	34.3	5	7.5
Chief officer	6	9.0	11	16.4
Totals	67	100.0	67	100.0
Years of Service				
5 or less	21	31.3	27	40.3
6 to 10	9	13.4	11	16.4
11 to 15	7	10.5	6	9.0
16 to 20	4	6.0	8	11.9
21 to 25	13	19.4	4	6.0
26 to 30	10	14.9	6	9.0
over 30	3	4.5	5	7.4
Totals	67	100.0	67	100.0
Attributes of fire ground deaths[b]				
Incendiary/suspicious fires	16		9	
Search/rescue operations	8		3	
Vacant buildings	6		0	
Motor vehicle accidents	8	100.0	21	100.0
False alarms	0	0.0	1	100.0

Comparison of Line-of-Duty Deaths between Career and Volunteer Fire Fighters, 1979

	Career fire fighters		Volunteer fire fighters[a]	
	Number of deaths	*Percent of deaths*	*Number of deaths*	*Percent of deaths*
Type of duty				
Operating at fire ground	43	68.2	30	60.0
Responding to or returning from alarm	8	12.7	11	22.0
Operating at nonfire alarm	2	3.2	3	6.0
Training	1	1.6	2	4.0
Other line of duty	9	14.3	4	8.0
Totals	63	100.0	50	100.0
Cause of fatal injury				
Exposure to fire products	19	30.1	9	18.0
Structural collapse	7	11.1	7	14.0
Falls, struck by object, contact with object	16	25.4	14	28.0
Stress	20	31.8	19	38.0
Other	1	1.6	1	2.0
Totals	63	100.0	50	100.0
Nature of fatal injury				
Burns and smoke inhalation	7	11.1	6	12.0
Burns only	3	4.8	1	2.0
Smoke inhalation only	10	15.9	3	6.0
Wound, cut, bleeding	0	0.0	1	2.0
Dislocation, fracture	12	19.0	11	22.0
Heart attack	22	34.9	22	44.0
Shock	1	1.6	0	0.0
Internal injury not classified above	8	12.7	5	10.0
Other	0	0.0	1	2.0
Totals	63	100.0	50	100.0
Ages of fire fighters				
All deaths				
20 and under	1	1.6	3	6.0
21 to 25	5	7.9	6	12.0
26 to 30	13	20.6	5	10.0
31 to 35	7	11.1	4	8.0
36 to 40	5	7.9	4	8.0
41 to 45	11	17.5	8	16.0
46 to 50	9	14.4	3	6.0
51 to 55	5	7.9	8	16.0
56 to 60	2	3.2	3	6.0
over 60	5	7.9	6	12.0
Totals	63	100.0	50	100.0

[a]For this report the term "volunteer" refers to any fire fighter who is not a full-time, paid member of a fire department.

[b]Since these attributes are not mutually exclusive, totals and percentages are not shown.

Comparison of Line-of-Duty Deaths between Career and Volunteer Fire Fighters, 1979 (Continued)

	Career fire fighters		Volunteer fire fighters[a]	
	Number of deaths	*Percent of deaths*	*Number of deaths*	*Percent of deaths*
Ages of fire fighters				
Deaths from heart attacks only				
31 to 35	1	4.5	0	0.0
36 to 40	2	9.1	0	0.0
41 to 45	4	18.2	6	27.3
46 to 50	5	22.7	1	4.6
51 to 55	4	18.2	7	31.8
56 to 60	2	9.1	3	13.6
over 60	4	18.2	5	22.7
Totals	22	100.0	22	100.0
Fire ground deaths by fixed property use				
Public assembly	4	9.3	5	16.7
Tunnel	1	2.3	0	0.0
Residential	12	27.9	11	36.7
Stores, offices	6	13.9	3	10.0
Storage	4	9.3	5	16.7
Vacant buildings	4	9.3	1	3.3
Highways, waterways	2	4.7	1	3.3
Grass, brush, forest	8	18.6	4	13.3
Manufacturing	2	4.7	0	0.0
Totals	43	100.0	30	100.0
Rank				
Fire fighter	47	74.6	38	76.0
Company officer	11	17.5	6	12.0
Chief officer	5	7.9	6	12.0
Totals	63	100.0	50	100.0
Years of Service				
5 or less	21	33.3	20	40.8
6 to 10	10	15.9	10	20.4
11 to 15	7	11.1	7	14.3
16 to 20	13	20.6	4	8.2
21 to 25	6	9.5	1	2.0
26 to 30	3	4.8	4	8.2
over 30	3	4.8	3	6.1
Totals	63	100.0	49	100.0
Attributes of fire ground deaths[b]				
Incendiary/suspicious fires	13		13	
Search/rescue operations	5		3	
Vacant buildings	4		1	
Motor vehicle accidents	8	100.0	15	100.0
False alarms	2	100.0	0	0.0

Comparison of Line-of-Duty Deaths between Career and Volunteer Fire Fighters, 1978

	Career fire fighters		Volunteer fire fighters[a]	
	Number of deaths	*Percent of deaths*	*Number of deaths*	*Percent of deaths*
Type of duty				
Operating at fireground	41	59.4	42	45.2
Responding to or returning from alarm	9	13.1	29	31.2
Operating at nonfire incident	4	5.8	12	12.9
Training	2	2.9	3	3.2
Other line of duty	13	18.8	7	7.5
Totals	69	100.0	93	100.0
Cause of fatal injury				
Exposure to fire products	9	13.0	10	10.8
Structural collapse	6	8.7	0	0.0
Exposure to chemicals or radiation	0	0.0	8	8.6
Falls, struck by object, contact with object	23	33.3	29	31.2
Stress	28	40.6	45	48.3
Other	3	4.4	1	1.1
Totals	69	100.0	93	100.0
Nature of fatal injury				
Burns and smoke inhalation	0	0.0	0	0.0
Burns only	7	10.1	2	2.2
Smoke inhalation only	8	11.6	16	17.2
Wound, cut, bleeding	17	24.6	19	20.4
Dislocation, fracture	3	4.4	8	8.6
Heart attack	28	40.5	44	47.2
Shock	3	4.4	2	2.2
Strain, sprain	0	0.0	0	0.0
Internal injury not classified above	0	0.0	1	1.1
Drowning	3	4.4	0	0.0
Other	0	0.0	1	1.1
Totals	69	100.0	93	100.0
Ages of fire fighters *All deaths*				
30 and under	16	23.2	24	25.8
31 to 35	6	8.7	6	6.4
36 to 40	8	11.6	8	8.6
41 to 45	10	14.5	10	10.8
46 to 50	12	17.4	12	12.9
51 to 55	8	11.6	8	8.6
56 to 60	7	10.1	9	9.7
over 60	2	2.9	16	17.2
Totals	69	100.0	93	100.0
Ages of fire fighters *Deaths from heart attacks and strokes*				
30 and under	0	0.0	1	2.2
31 to 35	0	0.0	2	4.4
36 to 40	1	3.6	4	8.9
41 to 45	6	21.4	3	6.7
46 to 50	8	28.6	9	20.0
51 to 55	5	17.9	6	13.3
56 to 60	6	21.4	6	13.3
over 60	2	7.1	14	31.2
Totals	28	100.0	45	100.0

Comparison of Line-of-Duty Deaths between Career and Volunteer Fire Fighters, 1978 (Continued)

	Career fire fighters		Volunteer fire fighters[a]	
	Number of deaths	*Percent of deaths*	*Number of deaths*	*Percent of deaths*
Fireground deaths by fixed property use				
Club	1	2.4	0	0.0
Nursing home	0	0.0	1	2.3
Residential	23	56.1	16	38.1
Stores	7	17.1	5	11.9
Storage	0	0.0	7	16.7
Vacant buildings	7	17.1	2	4.8
Highways, bridges, railways	1	2.4	4	9.5
Grass, brush, forest	2	4.9	7	16.7
Totals	41	100.0	42	100.0
Attributes of fireground deaths[b]				
Incendiary/suspicious fires	16		10	
Search/rescue operations	7		4	
Vacant buildings	7		2	
Motor vehicle accidents	10	100.0	28	100.0
False alarms	1	100.0	5	100.0

[a]For this report the term "volunteer" refers to any fire fighter who is not a full-time, paid member of a fire department.

[b]Since these attributes are not mutually exclusive, totals and percentages are not shown.

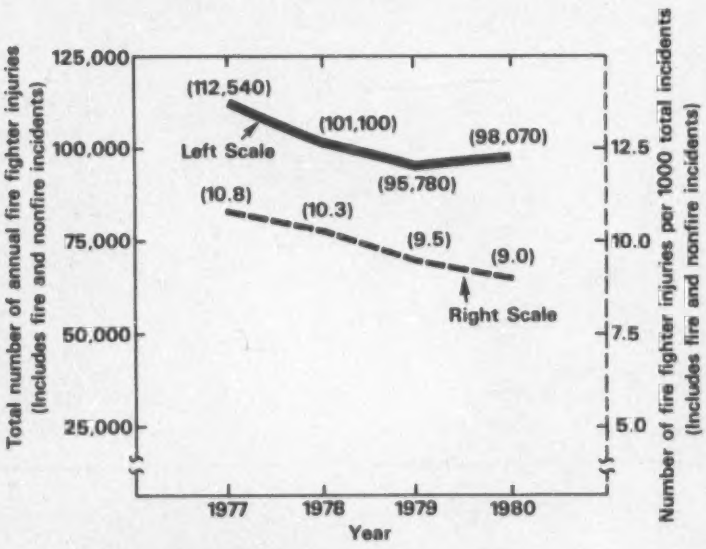
FIRE FIGHTER INJURIES AND INJURY RATES

The figure below presents estimates of the total number of fire fighter injuries and injury rates (injuries per 1,000 incidents) by year (1977–1980).

The total number of fire fighter injuries showed a steady decline during the 1977–1979 period from 112,540 to 95,780, a decrease of 14.9%, but increased slightly in 1980 to 98,070. When examining the number of fire fighter injuries per 1,000 incidents by year, there has been a slight, steady decline during the four year period from 10.8 injuries per 1,000 incidents in 1977 to 9.0 in 1980. Hopefully, these recent decreases in fire fighter injuries and injury rates are the result of increased concern and efforts to improve fire fighter safety by many fire departments across the country. Such efforts should continue, particularly in light of the fact that nearly 100,000 fire fighter injuries still occur annually in the U.S.

Other statistical measures for evaluating fire fighter injury risk indicate that for the 1977–80 period, there were 2.4 fire fighter injuries for every 100 fires attended, and that for the 1979–80 period, about 12% of all fire fighter injuries resulted in admission to a hospital.

Total Number of Annual Fire Fighter Injuries (left scale) and Number of Fire Fighter Injuries (right scale) (Includes fire and nonfire incidents by year, 1977–1980)



Source: NFPA's Survey of Fire Departments for U.S. Fire Experience (1977-80)

FIRE FIGHTER INJURIES BY TYPE OF DUTY

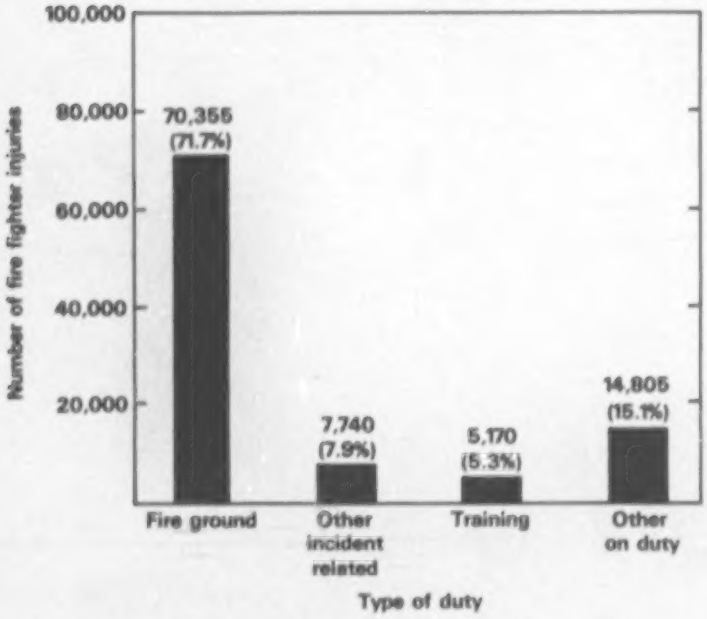
The figure below presents the number of fire fighter injuries by type of duty for 1980.

Type of duty includes the following:

- fireground (all activities from the moment of arrival to departure time, *e.g.*, extinguishment, overhaul)
- other incident-related (responding to or returning from an alarm, operating at a nonfire incident, etc.)
- training
- other on-duty (including inspection and maintenance duties)

The majority of fire fighter injuries, 70,355 or 71.7% of total injuries, occurred during fireground operations; 14,805 injuries or 15.1% occurred during other on-duty operations. These results are similar to 1978 and 1979 findings.

Fire Fighter Injuries by Type of Duty, 1980



Source: NFPA's Survey of Fire Departments for U.S. Fire Experience (1980)

FIREGROUND INJURIES BY NATURE OF INJURY AND TYPE OF DUTY

The table below presents fire fighter injuries by nature of injury and type of duty for 1980.

For injuries sustained during fireground operations, the three categories associated with exposure to fire products — burns and smoke inhalation, burns only, and smoke inhalation only — collectively accounted for 33.5% of all fireground injuries. Other major contributors were strain, sprain (25.4%), and wound, cut, bleeding (22.6%). The overall results for nature of fireground injuries were similar to 1979 results. During non-fireground activity, most of the injuries that occurred were strains and sprains, and wound, cut, bleeding.

Fire Fighter Injuries by Nature of Injury and Type of Duty, 1980

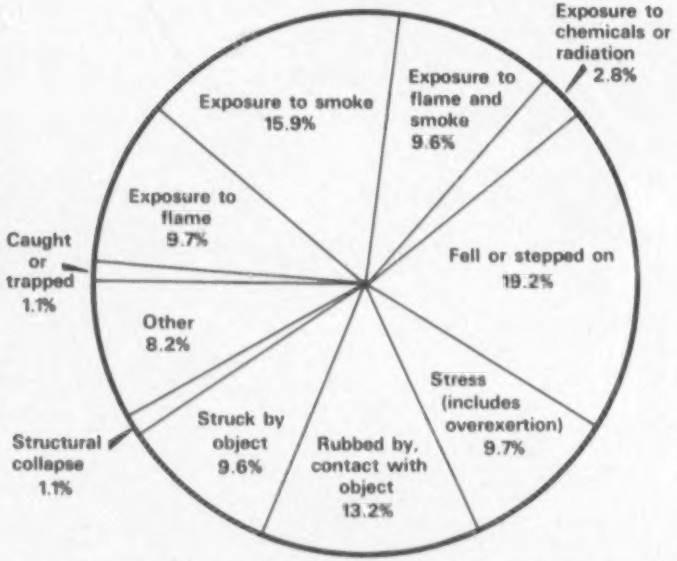
	Fireground		Other incident related		Training		Other on-duty	
Nature of injury	Number	Percent of fireground	Number	Percent of other incident related	Number	Percent of training	Number	Percent of other on duty
Burns and smoke inhalation (fire or chemical)	5,750	8.2	220	2.8	115	2.2	—	
Burns only (thermal or chemical)	6,150	8.7	180	2.3	365	7.1	290	1.9
Smoke inhalation only (fire gas or other gas)	11,690	16.6	255	3.3	90	1.7	—	
Wound, cut, bleeding	15,880	22.6	1,635	21.1	990	19.2	2,995	19.8
Dislocation, fracture	2,400	3.4	380	4.9	260	5.0	585	4.0
Heart attack	420	.6	35	.5	25	.5	130	.9
Shock	280	.4	30	.4	45	.9	25	.2
Strain, sprain	17,855	25.4	3,615	46.7	2,245	43.4	6,445	43.5
Internal injury not specified above	1,000	1.4	205	2.7	445	8.6	380	2.6
Other	8,930	12.7	1,185	15.3	590	11.4	4,055	27.3
	70,355		7,740		5,170		14,805	

Source: NFPA's Survey of Fire Departments for U. S. Fire Experience (1980)
If a fire fighter sustained multiple injuries for the same incident, only the nature of the single most serious injury was tabulated.

FIREGROUND INJURIES BY CAUSE

The figure below presents fire fighter injuries by cause for 1980. Exposure to smoke, and exposure to flames and smoke accounted for 25.5% of all fireground injuries. This fact emphasizes the necessity to use protective equipment, particularly self-contained breathing apparatus (SCBA). Other major causes of fireground injuries are fell or stepped on (19.2%); rubbed by contact with object *e.g.*, contact with live electrical wires (13.2%); stress includes overexertion (9.7%); and struck by object *e.g.*, impact by falling objects (9.6%).

Fireground Injuries by Cause*, 1980


Exposure to chemicals or radiation 2.8%
Exposure to flame and smoke 9.6%
Exposure to smoke 15.9%
Exposure to flame 9.7%
Caught or trapped 1.1%
Fell or stepped on 19.2%
Other 8.2%
Stress (includes overexertion) 9.7%
Struck by object 9.6%
Structural collapse 1.1%
Rubbed by, contact with object 13.2%

Source: NFPA's Survey of Fire Departments for U.S. Fire Experience (1980)

* Cause refers to the initial circumstance leading to the injury.

Based on 62,335 injuries estimated with data from departments reporting the breakdown.

FIRE FIGHTER INJURIES, INJURIES REQUIRING HOSPITALIZATION BY POPULATION OF COMMUNITY

The table below displays average number of injuries and injuries requiring hospitalization reported per department by population of community protected.

For both the average number of injuries and injuries requiring hospitalization (the second and third columns in the table below), the larger the community protected, the higher the injury figure. One can also examine the number of injuries requiring hospitalization per 100 injuries by population of community (column 4 below). This allows more direct comparison of the severity of injuries by population of community. Results indicate that the considerable differences in hospitalization injuries by population of community virtually disappear when expressed as a proportion of total injuries.

Average Reported Number of Fire Fighter Injuries and Injuries Requiring Hospitalization per Department by Population of Community Protected, 1980 (For All Types of Duty)

Population of community protected	Average reported number of injuries	Average reported number of injuries requiring hospitalization	Number of injuries requiring hospitalization per 100 injuries
500,000 to 999,999	366.44	24.11	6.6
250,000 to 499,999	198.05	19.95	10.1
100,000 to 249,999	70.57	8.96	12.7
50,000 to 99,999	29.69	4.72	15.9
25,000 to 49,999	11.25	1.05	9.3
10,000 to 24,999	5.02	.61	12.2
5,000 to 9,999	2.52	.39	15.5
2,500 to 4,999	1.17	.19	16.2
Under 2,500	.55	.10	18.2

*There was insufficient data for communities reporting in the one million or more category.
Source: NFPA's Survey of Fire Departments for U.S. Fire Experience (1980)

FIRES, FIREGROUND INJURIES, AND FIREGROUND INJURY RATES BY POPULATION OF COMMUNITY

The table below displays the average number of fires and fireground injuries reported per department, and fireground injury rates by population of community protected.

The tabulations appear to indicate (1) that the number of fires a fire department responds to is directly related to the population of the community protected, and (2) that the number of fireground injuries incurred by a department is directly related to its exposure to fire, i.e., the number of fires attended by the department. These two points are not surprising, and the second point is clearly demonstrated when we examine the range of the statistic. The average reported number of fireground injuries per department ranged from a high of 244.5 for departments that protect communities of 500,000–999,999 population to a low of .5 for departments that protect communities of less than 2,500 population.

A useful way to look at fire fighter injury experience and to obtain a reading on the relative risk that departments face is to examine the number of fireground injuries that occur for every 100 fires. This allows for more direct comparison between departments that protect communities of different sizes by taking into account their relative fire experience. Thus, the considerable difference noted in fireground injuries by population of community protected virtually disappears when relative fire experience is taken into account.

Average Reported Number of Fires, Average Reported Fireground Injuries per Department, and Injuries per 100 Fires by Population of Community Protected

Population of community protected	Average reported number of fires	Average reported number of fire ground injuries	Number of fire ground injuries per 100 fires
500,000 to 999,999	9,826.8	244.5	2.5
250,000 to 499,999	4,439.3	149.0	3.4
100,000 to 249,999	1,728.9	48.9	2.8
50,000 to 99,999	857.8	22.2	2.6
25,000 to 49,999	369.8	8.2	2.2
10,000 to 24,999	180.8	3.7	2.0
5,000 to 9,999	77.8	2.0	2.6
2,500 to 4,999	43.0	1.0	2.3
Under 2,500	20.6	.5	2.4

Source: NFPA's Survey of Fire Departments for U.S. Fire Experience (1980)
*There was insufficient data for communities reporting in the one million or more category.

AVERAGE FIRES, FIREGROUND INJURIES, AND FIREGROUND INJURY RATES BY POPULATION OF COMMUNITY AND REGION OF THE COUNTRY

The table below presents the average number of fires, and fireground injuries reported per department, and fireground injury rates by population of community protected and region of the country.

By region, results again indicate that the number of fires a fire department responds to is directly related to the population of the community protected, and that the number of fireground injuries incurred by a department is directly related to the number of fires attended by the fire department. By region, the Northeast reported a substantially higher number of fireground injuries for virtually all department sizes except for departments that protect the smallest communities (under 2,500).

The number of fireground injuries per 100 fires by population of community protected and region of the country is also displayed in the table below. The Northeast had higher rates than the other regions for virtually all department sizes. Thus, even when we take into account the relative high fire experience of the Northeast, the region still had higher fireground injury rates than the other regions of the nation.

Average Reported Number of Fires, Average Reported Fireground Injuries per Department, and Injuries per 100 Fires by Population of Community Protected and by Region of the Country

Column 1: Average reported number of fires
Column 2: Average reported number of fireground injuries
Column 3: Number of fireground injuries per 100 fires

Population of community protected	Northeast			Northcentral			South			West		
	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Col. 3	Col. 1	Col. 2	Col.3
500,000 to 999,999	—	—	—	9,798.0	379.3	3.9	11,880.6	247.0	2.1	5,540.3	104.0	1.9
250,000 to 499,999	7,212.3	596.3	8.3	4,462.0	141.8	3.2	4,172.3	94.1	2.3	3,542.2	52.0	1.5
100,000 to 249,999	3,654.6	148.0	4.0	1,582.5	51.6	3.3	1,809.2	42.1	2.3	1,126.3	25.7	2.3
50,000 to 99,999	1,456.4	47.2	3.2	674.7	20.5	3.0	801.8	15.6	2.0	610.0	10.3	1.7
25,000 to 49,999	827.3	12.6	2.4	327.0	10.1	3.1	380.6	4.9	1.3	286.2	5.5	1.9
10,000 to 24,999	246.0	6.3	2.5	147.9	3.2	2.2	169.9	2.7	1.4	153.5	2.8	1.8
5,000 to 9,999	93.7	3.8	4.1	62.2	1.1	1.8	83.4	1.5	1.8	76.7	2.0	2.6
2,500 to 4,999	43.5	1.3	3.0	36.2	.8	2.2	58.3	.7	1.2	44.7	1.2	2.7
Under 2,500	21.5	.5	2.8	18.9	.4	2.1	29.1	.8	2.8	16.9	.4	2.4

Source: NFPA's Survey of Fire Departments for U.S. Fire Experience (1980)
Note the, for the Northeast, there was an insufficient number of departments reporting statistics in the 500,000 to 999,999 category.

ESTIMATES OF THE NUMBER OF FIRE FIGHTERS AND FIRE DEPARTMENTS IN THE U.S.

There were approximately 1,115,800 fire fighters in the United States in 1979. Breakdowns show an estimated 216,550 career fire fighters and 899,250 volunteer fire fighters in the United States. Career are full-time, paid fire fighters. Volunteer fire fighters include call (*i.e.*, part-time) and fully volunteer fire fighters.

Most of the paid fire fighters (62.2%) are in departments that protect 50,000 or more people. Most of the volunteer fire fighters (89.3%) are in departments that protect less than 10,000 people.

The NFPA currently has 28,200 fire departments listed in its computerized Fire Service Inventory File of the United States. This number and the number of departments that responded to the NFPA 1979 National Fire Experience Survey provide the basis for estimates of the number of fire departments by type, which follow: 1,295 departments are all career; 4,455 are combination career and volunteer departments (675 of these are mostly career and 3,780 are mostly volunteer); and 22,450 are all-volunteer departments.

Estimated Career and Volunteer Fire Fighters in the United States (1979) by Population Protected

Population protected	Career	Volunteer	Total
1,000,000 or more	28,000	0	28,000
500,000 to 999,999	24,650	1,850	26,500
250,000 to 499,999	21,200	1,450	22,650
100,000 to 249,999	31,650	1,750	33,400
50,000 to 99,999	29,150	5,350	34,500
25,000 to 49,999	29,100	24,750	53,850
10,000 to 24,999	28,450	61,050	89,500
5,000 to 9,999	13,000	113,500	126,500
2,500 to 4,999	4,850	180,350	185,200
under 2,500	6,500	509,200	515,700
Total	216,550	899,250	1,115,800

Estimates are based on data reported by fire departments that responded to the NFPA 1979 National Fire Experience Survey.

Career fire fighters are full-time paid fire fighters. Volunteer fire fighters include call (part-paid) and fully volunteer fire fighters.

Department Type (percent) by Population Protected

Population protected	All career	Combination		All volunteer
		Mostly career	Mostly volunteer	
1,000,000 or more	100 %	0%	0%	0%
500,000 to 999,999	92.9%	7.1%	0%	0%
250,000 to 499,999	89.3%	3.6%	7.1%	0%
100,000 to 249,999	91.0%	5.1%	2.6%	1.3%
50,000 to 99,999	75.2%	13.9%	9.9%	1.0%
25,000 to 49,999	38.8%	16.5%	32.2%	12.5%
10,000 to 24,999	18.5%	17.8%	40.7%	23.0%
5,000 to 9,999	3.0%	4.8%	35.1%	57.1%
2,500 to 4,999	.7%	.7%	16.2%	82.4%
under 2,500	.6%	.1%	5.6%	93.7%
All Departments	4.6%	2.4%	13.4%	79.6%

Estimates are based on data reported by fire departments that responded to the NFPA 1979 National Fire Experience Survey.

Department type is reported as the percentage that a department type comprises in a given population interval (*e.g.*, for departments that protect 100,000 to 249,999, 91.0 percent of the departments are all career). Department type is broken down into three categories. All-career departments are comprised of 100 percent career fire fighters. Combination departments are comprised of career and volunteer fire fighters — this category is further broken down into mostly career departments comprised of 51-99 percent career fire fighters and mostly volunteer departments comprised of 1-50 percent career fire fighters. All volunteer departments are comprised of 100 percent volunteer fire fighters.

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GLOSSARY

The following are definitions of certain terms as they are used in *Fire Facts*.

Area of origin: The specific use of the area within the property where the fire originated.

Civilian: The term "civilian" includes anyone other than a fire fighter, and covers public service personnel such as police officers, civil defense staff, non-fire fighter medical personnel, and utility company employees.

Death: An injury that occurred as a direct result of a fire and that is fatal or becomes fatal within one year.

Direct property loss: Figures include only direct property damage to the physical structure and contents. Figures do not include indirect losses such as business interruption or temporary shelter provisions.

FIDO: The NFPA designed and operates the Fire Incident Data Organization (FIDO) System, a computerized data base which contains detailed information on individual fires of high technical interest. These fires include the more severe fires, particularly fatal fires, that occur throughout the United States for which the NFPA can obtain technical information. The FIDO System has been in operation since 1971 and contains approximately 50,000 fires added at a rate of 5,000 fires per year. Upon notification of a fire meeting FIDO inclusion criteria, the NFPA seeks additional information primarily from the public fire service. Other data from insurance sources, private fire brigades, and fire investigations (conducted by the NFPA, fire service, and other state and federal agencies) supplement fire department records. The data collected include information on detection and alarm (date, time, location, method of detection, performance of automatic detection systems); origin and development (area of origin, ignition source, material ignited, and other details of the ignition sequence, extent of fire spread); building construction; performance of automatic suppression systems; and value of direct property damage. Coding of data is guided by NFPA 901, Uniform Coding for Fire Protection. FIDO serves as the data base source for the annual multiple-death and large-loss studies as well as ignition scenario analyses.

Fire: Includes combustion explosions and fires that are out on arrival. Excludes controlled burning (whether authorized or not), overpressure rupture without combustion, mutual aid response, smoke scares, and hazardous responses (*e.g.*, oil spill without fire). In the case of an extension of a fire to exposed properties, the term includes just one fire, including all associated casualties and property loss.

Fire department: May provide fire prevention, fire extinguishment, and emergency rescue service in a given jurisdiction such as a county, municipality, or organized fire district. This excludes private fire brigades and departments that protect military installations.

Heat of ignition: The heat energy which brings about ignition.

Ignition scenario: The condition or situation that allowed a heat source and a combustible material to combine to initiate a fire.

Incendiary: Legal decision or physical evidence indicates that a fire was deliberately set.

Injury: Physical damage suffered by a person that requires (or should require) treatment by a practitioner of medicine within one year after the incident (regardless of whether treatment was actually received), or results in at least one day of restricted activity immediately following the incident. (Standard NFPA definition.) Examples of injuries resulting from fire are: smoke inhalation, burns, wounds, fractures, heart attack (resulting from stress under fire conditions), shock, strains, and sprains. The cause of injury may include: exposure to fire products, structural collapse, exposure to chemicals or radiation, stress under fire conditions, falls, being struck by object, or coming into contact with object.

Large-loss fire: A fire that resulted in a considerable direct property damage loss. Because of the effects of inflation, the NFPA in its 1980 large-loss report redefined a large-loss fire as one that caused $1 million or more in direct property damage.

Material first ignited: The combustible that is first set on fire by the heat of ignition.

Multiple-death fire: A fire that killed 3 or more people.

National Fire Experience Survey: The NFPA annually conducts a sample survey of fire departments in the United States to estimate the national fire experience. Based on the survey responses, the NFPA publishes in its annual U. S. fire experience report national estimates that include the following:

1. Overall number of fires and resulting deaths, injuries, and direct property losses.
2. Frequency of incendiary and suspicious structure fires and the resulting deaths and direct property damage.
3. Number of deaths and direct property losses for major property uses.

The annual fire experience report also includes year to year comparisons that indicate whether the fire problem is getting better or worse. The national fire experience survey also includes questions on nonfatal fire fighter injuries, and serves as the basis of the annual fire fighter injury report.

Property use: The use to which a property is put. A building for example, could serve as a garage or a department store. The use of property does not define

any of the other important fire-related details of property such as access, ownership, size, internal weakness in fire defense, or construction.

Region of the country: The four regions as defined by the U.S. Census Bureau include the following states:

Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

Northcentral: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Structure: An assembly of materials forming a construction for occupancy or use in such a manner as to serve a specific purpose. A building is a form of a structure. Open platforms, bridges, roof assemblies over open storage or process areas, *tents*, air-supported structures, and grandstands are other forms of a structure.

Suspicious: Circumstances indicate the possibility that a fire may have been deliberately set, multiple ignitions were found, or there were suspicious circumstances and no accidental or natural ignition factor could be found.

Type of duty for fire fighters: *fireground* (all activities from the moment of arrival to departure time, *e.g.*, extinguishment, overhaul); *other incident-related* (responding to or returning from an alarm, operating at a nonfire incident, etc.); *training; other on duty* (including inspection and maintenance duties).

Vehicles: Includes highway vehicles, trains, boats, ships, aircraft, farm vehicles, and construction vehicles.

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